FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 100
No. 2069
Registered at the G.P.O. as a Newspaper

JUNE 7, 1956
Offices: John Adam House, John Adam St., London, W.C.2

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The Iron and Steel foundries Regulations 1953

The problem of the jobbing foundry

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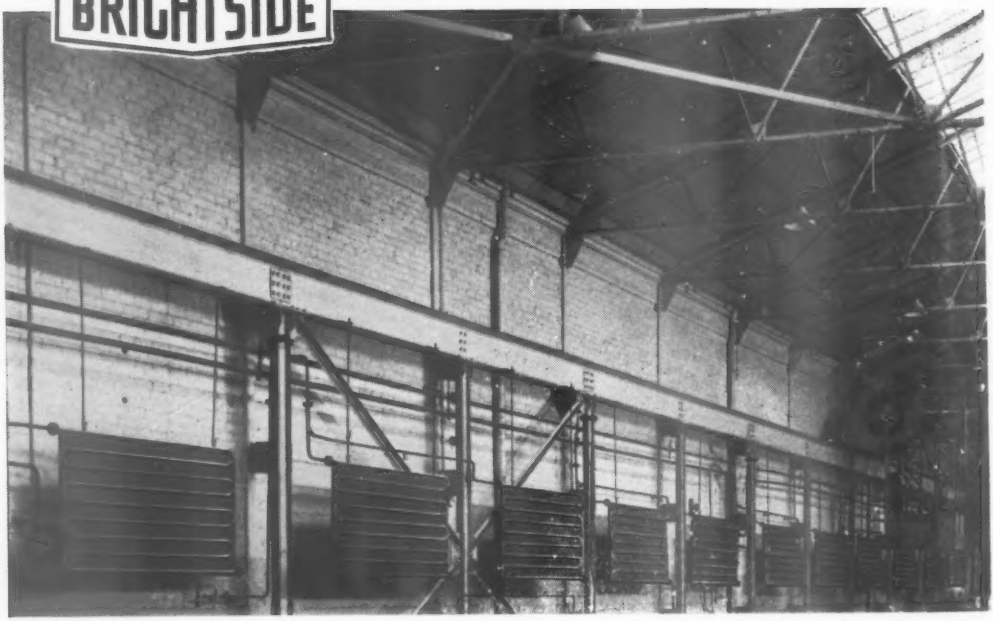

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FOUNDRY TRADE JOURNAL

Established 1902

Vol. 100 Thursday, June 7, 1956 No. 2069

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AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published Weekly

Single copy 9d.; by post 11d.:
Annual subscription: home 40s., abroad 45s. (prepaid).

17/19 JOHN ADAM STREET, ADELPHI, LONDON, W.C.2

'Phone: TRAfalgar 6171 (10 lines)
'Grams: Zacatecas, Rand, London.

Solution to a Sticky Problem ?

We recently visited the Berry Hill Quarry of the Mansfield Standard Sand Company, Limited, to inspect the preparation, not of moulding sand, but material for the building trade. Here was a sand containing 7 to 10 per cent. moisture, which was being passed through a bank of vibrating sieves, some 30 to 40 per cent. quicker than usual. This was the result of the application of electric heating to the lengthwise strands of the sieves. As it was a fine day, the moisture content of the sand was on the low side, and the wire of the sieves was just perceptibly warm. We were intrigued as to how it all happened, for in truth there was insufficient heat to dry the sand. It may be that damp sand sticks to metal surfaces because of some sort of capillary attraction.

Obviously our thoughts went to the possible application of the device to foundry practice. First, we realized that many, but not all, foundries have cylindrical sieves incorporated in the sand systems of their mechanized sand-handling plant, and we have been assured that the electric-heating system can—obviously at some increased cost—be applied in such cases. Even if, in the case of non-ferrous work, the heated screens only give cleaner rejected tramp metal, free from balls of sand, their adoption would represent an advance of some merit. There is another factor—the improved throughput at Mansfield was effected whilst using a riddle of finer mesh, yet there was the same amount of rejects, that is between 2½ and 7½ per cent. This factor may be of help to some foundries requiring a finer grade of material from the system for use as facing sand. A problem not entirely resolved in mechanized foundries, is the sticking of the sand in the hoppers placed directly over the moulding machines, and as a consequence there are but few installations which do not show hammer marks on the outside of the hoppers. It may be, for it is difficult to assess, that the installation internally of an electrically-heated and vibrated screen on the walls of the hopper would eliminate this obvious nuisance. The lips of sand elevator buckets are another source of trouble due to sand sticking, but here there is no obvious way of applying the vibration and heating.

This problem of sand adherence in sand-reconditioning systems has long been with us and its nuisance value is taking on added significance with the increasing tempo of mechanization. Many devices have been tried for cure or prevention but so far without complete success. The problem is especially acute in the Ardennes where the sand responsible for the splendid finish of the local castings, is of a particularly sticky nature, which renders mechanization a difficult problem. Who knows, the real solution may lie in some combined application of vibration and heat such as that outlined above?

* See JOURNAL, May 24, page 369.

National Foundry College

"Open Day"

A surprisingly large number of prominent foundrymen and many others closely associated with the industry, attended the "Open Day" of the National Foundry College, at Wolverhampton, last Thursday. The strong complement from the membership of the Institute of British Foundrymen included Dr. A. B. Everest, the president, Mr. H. J. V. Williams and Mr. J. Blakiston, the vice-presidents, and Mr. G. Lambert, the secretary. Also amongst those present were Mr. K. Marshall, director of the Joint Iron Council, and Mr. J. Butler, secretary of the Council of Ironfoundry Associations, in addition to a number of serving Governors of the College, members of the staff and visiting lecturers, and present and past students. The proceedings began in the hall of the Wolverhampton and Staffordshire Technical College, with the presentation by Sir Frederick Scopes (chairman of the Governors) of diplomas to students of the National Foundry College for the session 1953/54 and 54/55, 33 in all—representing an extremely high proportion of those taking the courses. Next, Sir Frederick addressed the gathering, saying that the foundry industry as a whole was going to benefit tremendously in the years to come when these college-trained men took their place in management and development posts.

The assembly then broke up to inspect the exhibits, equipment, demonstrations, etc., in the Foundry College itself. These were arranged on three floors as follow:

Top Floor

Diploma Room: Part I.—(*a*) Exhibition of students' practical work; (*b*) lay-outs, using models; (*c*) work-study; and (*d*) X-ray films and viewers. Part II.—Students' "project" work.

Middle Floor

Heat-treatment Room:—(*a*) Exhibition of s.-g. iron castings, and (*b*) heat-treatment furnaces in use. Polishing Room: Metallurgical specimen preparation. Metallography laboratory: (*a*) Bench microscopes showing various cast specimens; (*b*) Vickers' projection microscopes showing nodular graphite and pearlite in s.-g. iron, and (*c*) Vickers' hardness tester and pearlite in operation. Research laboratory: Examination of sands, casting defects, etc.

Ground Floor

Sand laboratory: (*a*) All routine tests; and (*b*) tests on shell-moulding sands. Experimental foundry: (*a*) Demonstration of shell moulding; (*b*) demonstration of CO_2 Process, and (*c*) other equipment.

The project work and displays of castings, "live" exhibits, and experimental work in progress were extremely well set out and provided much to attract both foundrymen and others of the party. In fact, if the interest shown by the visitors is any criterion, the College next session should have a greatly increased number of students—the very desirable objective stressed by Sir Frederick in his remarks at the presentation ceremony. The proceedings terminated with light refreshments served on return to the hall of the Technical College.

Foundry Technical Group

Dr. J. G. Pearce, director of the British Cast Iron Research Association, presided at the annual dinner of the Foundry Technical Group held at the Star & Garter Hotel, Wolverhampton, on Saturday, May 26. With him at the high table were Mr. J. Bamford, B.Sc., principal of the National Foundry College, Mr. A. R. Parkes, Mr. S. N. Wrightson, Mr. W. B. Hendry and Mr. J. B. McIntyre, senior lecturer at the College who acts as secretary to the Group. After the "Loyal" toast, Dr. Pearce, who is vice-chairman of the Governors of the College, made presentations to Mr. W. Prentice, a lecturer at the College who is leaving shortly to take up a position in industry; Mr. Prentice briefly thanked the members for the gifts. Mr. Parkes then proposed a toast to the continued prosperity of the Group, referring to the immense responsibility they shouldered individually and as a body in relation to the demands shortly to be made on the industry due to advances in modern engineering processes, automatic production techniques and the like. Mr. McIntyre replied for the assembled company, and the proceedings were adjourned for exchange of reminiscences in a lighter vein.

[The Foundry Technical Group, now numbering about 120 members, is comprised of past students and present staff of the National Foundry College and its pre-war forerunner, the British Foundry School. It has an annual intake of 20 to 30 members, but even now represents by its membership a wide and authoritative cross-section of well-informed foundry technology, and, of course, its potential is extremely great. It has among its aims regular meetings, and co-operation and exchange of information of the sort initiated while the members were at College. Such has been the progress registered by past students that directors, works managers, managers, and foremen, are now included in its make-up, and the membership represents a complete representation of supervision in all types of foundries, and all types of foundry activity. Also, it is of interest to note, there has been no wastage by transfer of members away from the foundry industry.]

Renfrew Foundries Shut-down

Over 120 employees at Renfrew Foundries, Limited, Hillington, Glasgow, were paid off at the weekend because of the close-down of one of the sections. In another two or three months, the remaining foundry at the factory—taken over by High Duty Alloys, Limited, from Renfrew Foundries, Limited, two months ago—will also be closed down, and a further 50 men will become redundant. The first department to shut, it is reported, will be the gravity-die-casting section, where 136 are employed; the pressure-die-casting section will follow during the summer. All that will remain at the factory will be the tool-room and patternshop, which will be used for dealing with work from the company's English works. Before the transfer took place, Renfrew Foundries, Limited, closed down the sand-casting section and over 100 men became redundant.

Cast Manganese Steel

When a translation of the paper by E. Piwowarsky and H. L. Roes on "Cast Manganese Steel" was printed in the JOURNAL April 5 and 12, acknowledgment should have been made to prior publication in *Geisserei*. Apologies are tendered to the publishers of the German journal and to readers for this omission.

HEAD, WRIGHTSON & COMPANY, LIMITED, Stockton-on-Tees, have secured a contract from the British Transport Commission worth £86,500, to build 50 new steel-compartment boats.

Aspects of Corrosion-resisting Steel Castings*

By W. G. Boustred

Dealing first with the historical side of stainless-steel properties, the Author next outlines the main types and discusses chemical composition and various treatments accorded to stabilize the structures. Next, manufacturing methods, melting and casting of these alloys is considered. A report is included of the discussion which took place when the Paper was delivered in South Africa.

At a meeting last session of the South African branch of the Institute of British Foundrymen, presided over by Mr. J. A. de Kiewiet, a film "Corrosion in Action," was shown by courtesy of the International Nickel Company. Part III of the film, which dealt with the "rendering of a metallic surface passive by means of a protective surface or layer," formed a preamble to Mr. Boustred's Paper which followed. The main concern of the Author was to describe methods of imparting corrosion resistance, taking into consideration only those alloys which have a ferrous or iron base and specifically with those alloys in the form of castings. The lecture continued as follows:

Types Dealt With

The following elements may be considered of greatest importance when discussing iron-base corrosion-resisting alloys: iron, carbon, silicon, chromium, nickel, molybdenum, copper, titanium and columbium. The alloys may be generally described as corrosion-resisting steels.

The most important of the alloying elements listed is chromium because iron or steel containing a chromium content of greater than say 10 to 12 per cent. is passive in the majority of aqueous solutions which would normally corrode these two metals. Thus, the earlier discoveries in the investigations into corrosion-resisting steels were made with alloys containing increasing percentages of chromium. The steels having this basic alloying element are to-day, however, not considered truly stainless, and it was not until other alloying elements—particularly nickel—were incorporated in the alloy, that the true "stainless" steels were developed.

The modern range of corrosion-resisting steels may be grouped under three main headings, namely:—

Class I: Steels containing 12 to 17 per cent. chromium as the basic alloying addition known as the martensitic or hardening stainless steels.

Class II: Steels containing 18 to 30 per cent. chromium which are known as the ferritic stainless steels.

Class III: Steels based on the classical 18 per cent. chromium 8 per cent. nickel composition and which are known as the 18/8 type or austenitic stainless steels.

(I) *Martensitic Stainless Steels:*

These steels have particular application where both corrosion- and wear-resisting properties are called for in a particular service environment. An everyday example of this requirement is the table knife. Here a corrosion-resisting steel is required which also may be hardened and tempered to give a sharp cutting edge, and for this purpose the cutlery grade containing, say, 14 per cent. chromium, 0.3 to 0.4 per cent. carbon is used. This steel may be forged or cast into intricate shapes and on quenching from optimum temperatures in a variety of quenching media, Brinell hardnesses up to 600 may be obtained. Subsequent tempering gives a great range of hardness and tensile properties which enables these steels to be used in a number of engineering applications.

(II) *Ferritic Stainless Steels:*

These steels contain sufficient chromium, which is a ferrite stabilizer, to ensure that the austenitic condition is not attained and thus they cannot be hardened by heat-treatment as was the case in the Class I steels. Due to their high-chromium content, these steels have great corrosion resistance under oxidizing conditions but they have the disadvantage that under reducing conditions their passivity is destroyed, and further their range of mechanical properties is poor. They are particularly bad in respect of impact properties, but they have application particularly where both corrosion- and heat-resisting properties are required. They stand up particularly well to sulphur-bearing atmospheres.

(III) *Austenitic Stainless Steels:*

As mentioned earlier, these steels are based on the classical 18/8 composition. They may be said to contain sufficient chromium to render them passive under most conditions and sufficient nickel to ensure that the alloy is completely austenitic. Here there is the great advantage of a single-phase alloy which also has good mechanical properties and which may be easily worked, cast and machined. These alloys are corrosion resisting to a large number of industrial acids and represent the majority of corrosion-resisting castings produced in both this country and overseas. Thus they may be considered in more detail.

Chemical Composition

The important element other than chromium and nickel is carbon. Carbon has a great affinity for chromium in ferrous solution resulting in the form-

* Presented at a meeting of the South African branch of the Institute of British Foundrymen. (Extracted from the *Engineer and Foundryman.*)

ation of chromium carbides. These carbides precipitate preferentially in the grain boundaries of the metal and result in so called intergranular corrosion or weld decay. This phenomenon may be explained by a number of theories, the most popular of which is that of chromium depletion. The areas adjacent to the precipitated carbides are considered to be depleted of chromium, with the result that a chromium content less than that required to ensure passivity is in solution in the austenite. Thus, the importance of the term "homogeneous solution" is realized. Large tonnages of alloy-cast-iron castings containing up to 20 per cent. chromium are produced for their abrasion-resisting qualities, but as a large percentage of the chromium is present in the form of precipitated carbides, these alloys are not corrosion resisting in any sense of the word. A further disadvantage of these precipitated carbides is that a duplex alloy is produced and a corrosion cell may be set up between the two phases. This problem of intergranular corrosion may be solved in a number of ways.

(1) *Heat-treatment:*

Providing the carbon content is sufficiently low these alloys may be reheated to the fully austenitic condition, that is with all the carbon in solution, and quenched either in air or water. The fast cooling rates prevent the carbon from coming out of solution, and result in a metastable room temperature state which is, to all intents and purposes, fully austenitic. Where possible all castings are given this treatment. Should the material be re-heated, however, to the so-called sensitizing range (500 to 800 deg. C.), the chromium carbides reprecipitate and return to their original state. Hence the difficulties of welding procedure is appreciated and the term "weld decay" describes the corrosion phenomenon experienced after welding.

(2) *Stabilization:*

This problem may be solved by stabilization. With this procedure elements such as titanium, columbium, and to a certain extent molybdenum, are alloyed with the stainless steel and combine preferentially with the carbon to form less harmful and finely dispersed carbides, leaving the chromium in solution to ensure full passivity. Of these elements columbium is particularly preferred for castings and must be added in an amount ten times the carbon percentage, to ensure that all the carbon present will be preferentially combined. Columbium, however, is an extremely high-priced alloy and consequently a third procedure has been developed.

(3) *Extra-low-carbon Alloys:*

With modern melting techniques to be described later, alloys containing as little as 0.03 per cent. carbon can be made without difficulty. These alloys are, generally speaking, weldable, particularly when up to 3.0 per cent. molybdenum, itself a carbide former, is present and have application under reasonably severe conditions. It is still advisable to quench annealed castings made to this specification, however, as it is usually convenient to do so.

Balance of Composition

Another problem concerning the chemical composition of these alloys is that of balancing the composition. Due to the possible formation of delta-ferrite, which subsequently may transform to the brittle sigma phase, again in a particular temperature sensitizing range (750 deg. C.), these alloys must generally be balanced in such a way that they remain fully austenitic. The ferrite stabilizers such as chromium, silicon, molybdenum and columbium must be balanced by the austenite stabilizers such as carbon, manganese and nickel, and a variety of formulæ have been developed to assist in this direction. An example of the formulæ used is:—

$$\text{Ni} + \tfrac{1}{2}\,\text{Mn} + 30\,\text{C} = \frac{(\text{Cr} + 1.8\,\text{Mo} + 2.5\,\text{Si} + 2\,\text{Cb} - 16)^2 + 12}{12}$$

The other elements mentioned, copper and also molybdenum, are added to improve corrosion resistance under certain severe conditions, particularly reducing conditions, where the danger of so-called "pitting corrosion" is great. Those who are familiar with the service conditions in the uranium industry will be familiar with the specification AISI 316. This specification calls for carbon 0.1 per cent. (max.), chromium 16 to 18 per cent., nickel 10 to 14 per cent., molybdenum 2.5 per cent., and gives good results in dilute sulphuric acid which may be considered a particularly severe environment. Here the 0.1 per cent. carbon maximum ensures no precipitated carbides. Sixteen per cent. chromium minimum ensures maximum passivity. Ten per cent. nickel minimum ensures a fully austenitic structure and imparts improved corrosion resistance, and 2.5 per cent. molybdenum enhances resistance to "pitting corrosion" and corrosion under reducing conditions. For welded structures this alloy may be obtained in the stabilized condition, *i.e.*, generally containing 1 per cent. columbium or 0.5 per cent. titanium. Space does not permit further discussion on chemical composition but the so-called "super alloys" may be mentioned, as castings in these specifications are produced in South Africa.

First there is the Durimet 20, Carpenter 20 or Worthite type having composition approximating to carbon 0.07 per cent. max., chromium 20 per cent., nickel 30 per cent., molybdenum 3 per cent., copper 3 per cent. This alloy gives particularly good service in mixtures of acids but, owing to the expense involved, is only used under severe conditions. Secondly, there is a range of alloys which contain so little iron that they must no longer be considered ferrous in nature. A typical percentage composition is:—C 0.15 (max.); Fe 6.0; Cr 14.0; Ni 57.5; Mo 17.0, and W 4.0.

These alloys are extremely expensive but find application in the severest of conditions. Some of them may be precipitation hardened to a Brinell of say 350 which is an advantage when erosion is

associated with corrosion. In the film it was shown that an alloy of this type known as Hastelloy C still retained its mirror finish after a ten-year exposure to sea atmosphere.

Manufacturing Methods

As this is essentially a Paper for foundrymen and not metallurgists, a short description of production methods used in the manufacture of these castings will be of interest. However, although difficult to make compared with the common grades, the essence of their success in service lies in the metallurgical control exercised in their manufacture. Thus melting procedures must be discussed.

Metal for these castings is generally made in either direct electric-arc furnaces or in high-frequency induction furnaces.

Direct Arc Furnaces:

It is well known that in this type of furnace either oxidizing or reducing conditions exist. In view of this fact the problem of using stainless-steel scrap and foundry returns is a formidable one. During melting down, carbon is either picked up from the graphite electrodes or, if conditions are oxidizing, chromium metal is converted to chrome oxide and a difficult slag condition results. However, with the advent of the oxygen-blowing technique these problems may be overcome and the low-carbon alloys may be produced. This technique depends upon the physical chemical fact that at temperatures of the order of 1,600 deg. C. the oxidation affinity of carbon is greater than that of chromium, and further that the oxidation of carbon, silicon, and chromium are exothermic reactions.

The following procedure is therefore adopted: 18/8 scrap is melted under reducing conditions as far as possible with a melt in carbon of, say, 0.3 per cent. The bath temperature is raised to, say, 1,600 deg. C. and, after slagging off, oxygen blowing is commenced. Very high temperatures are reached and during the blow the carbon is reduced to the required level, and quite a large percentage of chromium is lost to the slag. With the use of slag deoxidants, however, such as ferro-silicon and ferro-chromium silicon the majority of the chromium oxide is reduced, and metallic chromium is driven back into the bath. Necessary optimum slag conditions are attained, adjusting alloying additions made, and the heat is tapped. This technique has many variations with initial 18/8 scrap charge percentages varying considerably but up to 100 per cent: 18/8 scrap has been used.

High-frequency Induction Furnace:

As melting may be carried out under almost neutral conditions this unit offers a somewhat easier method for the manufacture of low-carbon 18/8 type alloys. Generally speaking, what goes into the charge of a high-frequency induction furnace determines the final composition of the liquid metal. It has been established, however, that for optimum results, particularly with respect to carbon percentage, a definite process must be worked and carbon contents of the order of 0.04 per cent. can be attained.

Careful segregation and classification of scrap and foundry returns is essential, and the percentage of scrap in each charge should be limited to an extent dependent upon the quality of the scrap available in relation to the final carbon level required. It may be of interest to note that carbon recoveries of over 100 per cent. have been obtained, and this phenomenon is obviously due to dirty scrap, alloying additions, and conditions in and around the furnace.

Recent developments in high-frequency practice have enabled certain manufacturers to claim an actual carbon drop during melting. The last few points of carbon are the important ones, and the difference between an 0.05 per cent. C melt and an 0.09 per cent. C melt is considerable. Gassy heats can be a problem in induction melting, as generally no vigorous carbon boil occurs. Moisture is perhaps the greatest culprit in this direction, and necessary precautions must be taken. Certain manufacturers do operate with arc-furnace techniques in induction furnaces, but this may be considered difficult and even dangerous, particularly with smaller units where linings are, of necessity, thin.

Foundry Methods

To quote a recent overseas publication it may be stated that the alloys under discussion " are characterized by high-melting point, narrow pouring temperature range, relatively poor fluidity, and high volume and linear contraction on solidification and cooling." Personally, the Author would add " the tendency to form heavy oxides in the liquid state," but it is obviously unnecessary to enumerate further characteristics, as the foundryman is already in a certain amount of difficulty. Further, the high cost of the metal to be poured into the moulds makes the desire to avoid waste even keener.

The service conditions necessitate the avoidance of shrinkage cavities where concentration cells may be set up, and optimum surface conditions free from sand or slag inclusions greatly enhance corrosion resistance. All the above factors point to one solution, and that is, the use of the very best foundry practice with cost as a secondary consideration.

Dry-sand moulding techniques may generally be preferred and many of the moulds are built up from cores. Green-sand methods are used, particularly for castings of thinner sections where hot-tearing during the solid contraction can be a problem. Shell moulding can give excellent results, where the number off justifies the pattern costs involved. The problem of carbon pick-up from the resin bond is not as great as was originally anticipated.

Running and risering practice must be carefully considered. The use of chokes and whirl gates ensures a reduction in metal turbulence, and the use of exothermic and atmospheric feeder-heads ensures sound castings. Full works observation control must be exercised to establish and maintain optimum pouring temperatures for all grades and sizes of castings. These methods give rise to

comparatively high foundry costs, but they definitely pay dividends.

Certain machine shops have experienced difficulty in machining these austenitic grades due to their propensity to harden as a result of cold working. With the use of heavy machines, however, slow speeds and heavy cuts with sharp tools, machining presents no problem.

The chairman then called upon Mr. D. Gordon Jones to open the discussion.

DISCUSSION

MR. D. GORDON JONES said the 316 quality steel was almost universally used locally and this was probably due to the fact that this alloy met a wide range of specifications, production was generally simplified and melting and casting procedures could be standardized. Did Mr. Boustred use stabilizing element in this composition? A personal opinion was that if the carbon was maintained at the low level of 0.05 to 0.07 per cent. it was generally unnecessary. One may take it that 1.5 per cent. Mo was equivalent to 0.01 per cent. C, thus an 18/8/3 Mo steel at 0.07 per cent. C was equivalent to an 18/8 steel with 0.05 per cent. C, which would pass the AID weld decay test.

In his early days " weld decay " or " intergranular corrosion " was well to the fore and was interesting in showing how a small percentage of an element could cause such remarkable changes in the properties of an alloy. An 18/8 steel with about 0.15 per cent. C could, by suitable heat-treatment and chemical attack be changed into a texture resembling rubber or be reduced to a heap of powder. In cross-over welds neat holes could be drilled by exposing the specimen to the Strauss test. Research had now determined the cause and the addition of stabilizers Ti and Nb, or adjustment of composition had almost eliminated this defect.

Stainless steel was now in universal use, from the domestic kitchen to the large chemical plant. It was a wonderful servant and, if applied properly, would give excellent service.

The film had shown the " how and why " and the precautions to be observed for optimum corrosion resistance to be obtained.

In reply to Mr. Jones, MR. BOUSTRED stated that no stabilizing elements were added, unless called for by the customer's specification. Mr. Boustred confirmed that he had seen castings with intergranular corrosion, and they had lost all their metallic nature and looked almost like rubber.

DR. J. M. BEREZA contributed to the discussion by showing and explaining photomicrographs of corrosion-resisting steels, " as-cast " and subjected to various heat-treatments.

MR. J. STEELE asked if corrosion-resisting castings had been made in CO_2 moulds.

MR. BOUSTRED affirmed that this had been done in core assembly jobs but as far as could be judged, there was no apparent advantage over oilsand cores. With CO_2 cores, the breakdown was not so good as with oilsand and there was a tendency for hot tearing.

MR. FINDLEY requested information as to whether castings were tested for sensitivity.

MR. BOUSTRED replied that although there were standard tests for sensitivity in their organization, they concentrated more on the chemical, physical and micro-structure examinations.

MR. DE KIEWIET commented that the Paper and film were indeed timely in South Africa, in view of the advent of the uranium plants. He then called upon Mr. J. Steele to propose a vote of thanks.

MR. STEELE requested Mr. D. Gordon Jones to convey the thanks of the branch to the International Nickel Company for the loan of the film. He also thanked Mr. W. G. Boustred for an excellent presentation and coverage of a very important subject.

Thanks were also tendered to DR. BEREZA for his contribution of the photomicrographs.

New Metro-Vick Apprentice Hostel

For many years the majority of candidates for professional engineering training at the Trafford Park works of Metropolitan-Vickers Electrical Company, Limited, have come from homes outside the Manchester area. Accommodation for these apprentices has until now been found in lodgings in the vicinity of the works, and in general this has proved a very satisfactory arrangement. However, in view of the need to increase the number of candidates from public schools and grammar schools, the company has decided to build a new hostel that will provide accommodation initially for approximately two hundred.

An excellent site, known as Tyntesfield, has been found in Sale, Cheshire. Though across the county boundary, the hostel will be only four miles from the works and some seven miles from the centre of Manchester. The site is adjacent to the main Manchester to Chester road, thus affording convenient transport facilities to the works and the city, with ready access to the Cheshire countryside in the opposite direction. The hostel itself will be of modern design, and in its construction care will be taken to preserve the amenities of the well-wooded site. It is hoped to have the hostel available for those who commence their training in September, 1958.

Automation and Redundancy

Automation did not necessarily mean redundancy in the sense that people concerned would no longer be required by the company, Sir Alexander Fleck, chairman of Imperial Chemical Industries, Limited, told 600 representatives of the group's management and workers on May 25. Sir Alexander, who was addressing the ICI central council at Margate, said that mechanization and automatic control led to redundancy only in the narrow sense that the same number of people were no longer required to perform the same task. While there might be fewer jobs such as machine minding, there would almost certainly be an increase in other types of work.

Automation, relying principally on instrumentation and emphasizing skill and training, would, it was suggested, require an increase in technical staff and in employment in drawing and planning offices. Sir Alexander said that since the trend was gradual he did not envisage that these transitions would prove difficult, especially when taken in conjunction with continued prospects of expansion. A better standard of living and an expanding economy meant more jobs, although it might mean different jobs for some. The human problems involved, he said, must not be underestimated.

Birthday Honours

A number of people associated with the foundry, iron and steel, and allied industries received awards in the Birthday Honours List, which was published last Thursday. Details of some of the principal awards and biographical notes on the recipients are given in what follows:—

Viscount

LORD CHERWELL, Professor of Experimental Philosophy at Oxford, and Paymaster-General from 1942 to 1945 and from 1951 to 1953, for public services. He was formerly director of the RAF Physical Laboratory at Farnborough and in the last Conservative Government he was appointed the Prime Minister's adviser on atomic research and development, and on scientific and statistical matters generally.

Baron

LT.-GEN. SIR RONALD WEEKS, who retired last week from the chairmanship of Vickers, Limited, which he had held since 1949. Sir Ronald also resigned last autumn from the chairmanship of the English Steel Corporation, Limited, to which he was first appointed in 1946. He has served on the boards of many companies, including Associated Electrical Industries, Limited, and has been president of the British Scientific Instrument Research Association and chairman of the National Advisory Council on Education for Industry and Commerce.

Knights Bachelor

MR. AUSTIN INNES ANDERSON, who has been chairman of the Orient Line since 1952, for services to the British shipping industry. His directorships have included that of R. & H. Green & Silley Weir, Limited, ship-engine and boiler repairers; he represents the Chamber of Shipping on the British Shipbuilding Research Association. MR. HORACE WILLIAM CLARKE, chairman of the Aluminium Industry Council. Mr. Clarke is chairman and managing director of James Booth & Company, Limited, and John Wilkes, Sons & Mapplebeck, Limited. MR. GEORGE HERBERT DOWTY, chairman of the Dowty Group, Limited, manufacturers of hydraulic equipment for the mining, aircraft, and agricultural industries. He was president of the Royal Aeronautical Society in 1952-53. PROF. WILLIAM JOHN PUGH, director of the Geological Survey of Great Britain and the Museum of Practical Geology, since 1950, and MR. GERARD SPENCER SUMMERS, a director of John Summers & Sons, Limited, who has also served as a vice-president of the British Iron and Steel Federation.

Order of St. Michael and St. George
CMG

MR. D. H. BLACK, chief scientific officer of the Ministry of Supply.

Order of the British Empire
Civil Division
KBE

MR. HUBERT NUTCOMBE HUME, deputy chairman of the Colonial Development Corporation. He is also a director of British Industries Fair, Limited, and is a member of Council of the British Institute of Management.

CBE

MR. R. P. BEDDOW, director of many companies, including Mansill, Booth & Company, Limited, and J. W. Singer & Sons, Limited. MR. L. H. BEDFORD, of the English Electric Company, Limited. CAPT. E. D. CLARKE, managing director of Saunders-Roe, Limited. MR. R. M. CURRIE, head of the work-study department of Imperial Chemical Industries, Limited. BRIG. KENNETH HARGREAVES, managing director of Hargreaves (Leeds), Limited. LT. COL. T. E. SMITH, managing director of Smith's Dock Company, Limited, North Shields. DR. CHARLES SYKES, managing director of Thos. Firth & John Brown, Limited, the Sheffield steelmakers, and a former chairman of the divisional panel of the metallurgy division of the British Iron and Steel Research Association. MR. A. B. WATTS, a director of British Ropes (Southern Sales), Limited, Doncaster.

OBE

MR. GEOFFREY BARLOW, managing director of Meters, Limited, Manchester; MR. R. A. BROWNING, director of contracts, UK Atomic Energy Authority; MR. M. L. JOFEH, deputy chief engineer of the Sperry Gyroscope Company, Limited; MR. A. H. LAYHE, manager of the purchasing department of British Insulated Callender's Cables, Limited; MR. ARTHUR SOUTHWAY, a director of R. W. Crabtree & Sons, Limited; MR. A. H. TAYLOR, principal scientific officer at the Fuel Research Station of the Department of Scientific and Industrial Research.

MBE

MR. J. B. BRENNAN, general secretary, Institution of Chemical Engineers; MR. H. F. BURRELL, lately manager, general engineering department, Vickers-Armstrongs, Limited, Barrow-in-Furness; MR. H. R. CANNING, manager, marine department, British Thomson-Houston Company, Limited, Rugby; MR. G. L. CARDWELL, chief die designer, drop forge department, English Steel Forge & Engineering Corporation, Limited; MR. J. G. COLVILLE, assistant shipyard manager, Harland & Wolff, Limited, Belfast; MR. JAMES CROWTHER, chief metallurgist, James Booth & Company, Limited, Birmingham; MR. R. G. ELLEN, performance control engineer, Standard Telephones & Cables, Limited, North Woolwich; MR. J. A. FORREST, principal senior lecturer, Birmingham College of Technology; MR. J. A. GILLILAND, shipyard manager, Cammell Laird & Company, Limited, Birkenhead; MR. W. J. HARRIS, secretary, Sir James Laing & Sons, Limited, ship builders and repairers, of Sunderland; MR. A. W. MENZIES, process development manager, Sir W. G. Armstrong Whitworth (Aircraft), Limited, Coventry; MR. D. R. E. O'NEILL, technical sales manager, London Aluminium Company, Limited, Birmingham; MR. G. S. PALMER, manager, titanium melting plant, William Jessop & Sons, Limited, Sheffield; MR. D. G. REAVEY, dock engineer manager, John Brown & Company (Clydebank), Limited; MR. A. H. SELBY, production manager, Geo. W. King, Limited, of Stevenage (Herts); MR. JOHN SENIOR, member, Northern Regional Board for Industry; MR. ALFRED SHAW, battery division sales manager, Crompton Parkinson, Limited; MR. ARTHUR TAYLOR, of Richard Thomas & Baldwins, Limited; MR. HAROLD THORNTON, Tees district secretary, Amalgamated Engineering Union.

British Empire Medal

MR. EDWIN BRIERS, smith, Metropolitan-Cammell Carriage & Wagon Company, Limited; MR. CHARLES BURN, apprentice instructor, Marshall Richards Machine Company, Limited; MR. H. J. COLENUTT, foreman electrician, John I. Thornycroft & Company, Limited; MR. W. A. EATON, head foreman, armour-plate shop, Hadfields, Limited; MR. C. H. HUMPHRIS, grinder, Rotol, Limited; MR. JOHN IRWIN, fitter, Sirocco Engineering Works, Davidson & Company, Limited; MR. R. W. JACKSON, chargehand, Albright & Wilson, Limited, and MR. GEORGE OLSEN, horizontal borer, Dawson & Downie, Limited.

Iron Castings Output Maintained

Production of iron castings in the first quarter of 1956 was 1,039,670 tons, compared with 1,013,520 tons in the first quarter of last year. The Iron and Steel Board gives the following district production figures for the first three months of this year, with the figures for the corresponding period of 1955 in parentheses:—North-East, 82,330 (79,490) tons; North-West, 134,630 (131,940) tons; Yorkshire, 114,560 (112,820) tons; East Midlands, 208,480 (204,540) tons; West Midlands, 209,140 (201,380) tons; Eastern Counties, 39,630 (39,730) tons; Southern Counties, 82,870 (86,140) tons; Scotland and Northern Ireland, 106,150 (101,760) tons; Wales, 61,880 (55,720) tons.

Commenting on the Iron and Steel Board's announcement, the Council of Ironfoundry Associations states that the output of iron castings, in total, in the first quarter of this year was almost exactly at the level of the previous quarter and 2.6 per cent. above the first quarter of 1955.

Output of ingot moulds, predominantly used in steel production, continued at the very high level reached in the previous quarter. Production of cast-iron pipes and castings for the engineering and railway industries was on the increase. By contrast the output of automobile castings was down by 6 per cent. compared with the previous quarter, though it was still slightly above the level of the first quarter of 1955. Production of building and domestic castings was also lower.

Although the rise in iron castings output compared with a year ago was only moderate, the increases have been fairly widely distributed between the main producing regions. Only the eastern and southern regions had a lower output than in the first quarter of 1955.

The ironfounding industry's consumption of its principal raw materials was:—Pig-iron (including refined iron), 657,510 tons, against 649,830 tons in the first quarter of 1955, representing an increase of 1.2 per cent.; scrap (about half is foundry circulating scrap), 820,380 (816,890) tons, representing an increase of 0.4 per cent. The Council of Ironfoundry Associations states that the industry is making increasing use of hematite pig-iron, but the consumption of some other grades of iron has shown a tendency to decline and foundries have also been reducing their stocks of these grades.

New POA Booklet

The Purchasing Officers Association has published a booklet describing the basis of compilation and the commodity content of the price indicators which are issued regularly by various authorities, and which are widely used in assessing the price trends of materials and products in many branches of industry. The indices covered are the privately compiled Reuter's, Moody's, *Financial Times*, and *Economist's* series, as well as the Board of Trade figures relating to specific industries. The essential features of the booklet are the listings of the commodities on which each index is based and the relative importance, by value, of each; this knowledge is essential to an understanding of the implications of price index variations. The booklet "Economic Indices" is obtainable from the Association at Wardrobe Court, 146a, Queen Victoria Street, London, E.C.4 (price 1s. 6d. post free).

VICKERS, LIMITED, Babcock & Wilcox, Limited, and the Associated Cement Companies, Limited, of India, are considering the possibility of setting up a joint company in India to manufacture cement-making machinery, boilers, and other engineering products.

Titanium for British Industry

One of several statements of interest to a wide section of industry which appear in the annual report of Imperial Chemical Industries, Limited, is that which announces that the company has, for the time being at least, been enabled "to lead the world in the race for cheaper titanium." The directors claim that this has been brought about by their decision to offer raw titanium at around 21s. a pound. The metal division's plans for increasing output of wrought titanium products, it is stated, are fully supported by industry's interest in this new metal.

Another point which emerges from the report is the fact that last year the group's expediture on research and development amounted to nearly £9,500,000. However, it is pointed out that more and more the main consideration with regard to this essential work is not the amount which can be justifiably spent, but the availablity of suitably educated and trained staff.

Some £33,000,000 was spent by the group in 1955, on its construction programme, making a total expenditure up to the end of that year of £223,000,000 on new fixed assets since the end of the war. Gross expenditure on physical assets during the year was approximately £43,000,000, and there are year-end commitments of some £31,000,000. The full accounts of the company show that total group assets expanded from £523,500,000 to £552,300,000, the aggregate amount of capital employed rising from £438,000,000 to £458,000,000.

Increased manufacturing capacity and greater demand for products resulted in record sales in the home market, while the value of exports from this country was also at a peak level—the increase of £3,600,000 to £71,100,000 being mainly one of volume, since average export prices were relatively stable throughout the period. Group manufacturing and trading profits, however, at £56,350,000, against £49,500,000, have not risen proportionately to the sales increase. The effects of higher turnover and further improvement in efficiencies were more than offset by increases in fuel, raw materials, wages, and salaries, and profit margins on turnover have been reduced as a result of the group's policy of absorbing increased costs where this can be justified, declares the board.

IBF Cardiff Conference Fund

In addition to the subscriptions to the conference fund of the Institute of British Foundrymen, published in the April 12 issue of the FOUNDRY TRADE JOURNAL, the following donations have been received:—

	£	s.	d.
Previously acknowledged	1,909	0	0
Engineering & Allied Employers' South Wales Association	50	0	0
Baglan Engineering Company, Limited ...	25	0	0
Paterson Hughes Engineering Company, Limited	25	0	0
Taylor & Sons, Limited	15	0	0
James Durrans & Sons, Limited ...	10	10	0
C. & A. Fontaine	10	0	0
Tangyes, Limited	10	0	0
Davies & Company	1	0	0
Total ...	£2,055	10	0

THE SALES ORGANIZATION of Martin, Black & Company (Wire Ropes), Limited, Coatbridge, has been extended to cover the north-east of England, a branch office, under the management of Mr. K. Murdoch-Smith, having been opened at Guildhall Chambers, 13, Sandhill, Quayside, Newcastle-upon-Tyne.

Heavy Fuel-oil Gasification for Metallurgical Furnaces

UK Team Inspect French Installations

The orthodox coal-fired gas producer, while it fills an important service in many directions, does not readily lend itself to single-furnace operation due to the relatively small capacity required. An alternative system is that involving the gasification of oil, it having numerous advantages, among which is its high thermal conversion efficiency and its applicability to single-furnace operation. The system has particularly been developed by the *Office Central de Chauffe Rationelle* (*OCCR*), the licensees in this country and the British Commonwealth being Wellman Smith Owen Engineering Corporation, Limited.

To investigate the system operating under working conditions, a party of furnace engineers, fuel technologists and metallurgists from the UK visited France earlier this year. As the gasifiers have been in operation in France for some five years, it was felt useful information could be obtained by seeing various plants operating and getting some practical results from the firms concerned. Two works were visited and meetings were held with the *Office Central de Chauffe Rationelle* and at which the *Institut de Recherches de la Sidérurgie Française* (the French equivalent of the British Iron & Steel Research Association), was represented.

Principle of the Gasifier and Its Control

Briefly, the principle of the oil-gasification process is that fuel oils can be completely converted to gases and finely divided free carbon by partial combustion with about one-third of the theoretical air. The gasifier construction (Fig. 1) consists of a cylindrical shaft into the base of which oil and primary air tuyeres are introduced. These are arranged at the periphery in such a manner as to impart a swirling spiral motion to the mixture of oil and gas. The volume of primary air introduced is controlled in relation to the amount of fuel oil supplied to the gasifier. The pressure in the primary-air ring-main from which the air tuyeres are supplied, governs the supply of oil to the gasifier chamber. Oil is supplied to the gasifier from a constant-level tank. The pressure in this tank is maintained at that prevailing in the primary-air ring-main, and causes oil to be fed to the gasifier through a calibrated orifice in the oil-feed pipe, in direct ratio to the primary-air pressure. By this arrangement, the oil:air ratio is constant for any given primary-air pressure and preset orifice diameter. The gas produced is at a temperature of about 1,200 deg. C. and has a total heating value of about 215 B.Th.U. per cub. ft., made up as follows in B.Th.U. per cub. ft.: Sensible heat, 50; heat from combustion of free carbon, 45; net calorific value of gas. 120.

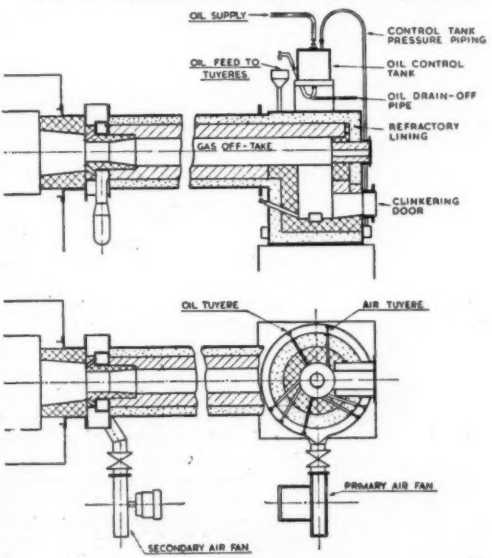
The following is a brief report of experience gained at the two works visited, the tour being arranged by Thomas Black, Limited, in conjunction with the Wellman Smith Owen Engineering Corporation, Limited.

Renault Works, Billancourt, Paris

The plant inspected at this works consists of two malleablizing ovens, each fired with its own gasifier. Ovens were originally under-fired with semi-producer gas, and in one case the gasifier has been arranged to introduce the oil gas into the original underflue arrangement. In the other case the oven has been modified to introduce the oil gas through a double-port burner in the back wall of the oven immediately below the roof and the positions of the waste gas exit ports have been changed from the longitudinal centre line to both ends of the furnace. In the case of the top-fired oven, the burner port included a dual secondary-air arrangement, the secondary-air tuyeres being arranged to give some control of the flame length.

Each gasifier has a maximum capacity of about 35 gall. per hour reducing to 12 gall. per hour, the limits being sufficient to cover the varying heat input requirements for the temperature cycle of the oven. The gasifier has two oil tuyeres which were used

FIG. 1.—*Elevation and plan of the gasifier.*



alternately, changing over manually every two hours. During discussions with the operators and the management, it was established that the gasifier did not require any cleaning out during the five-day firing cycle. From a total oil consumption of 7 tons during the five-day cycle, approximately a bucketful of coke is removed when the plant is shut down and the cleaning-out period only takes a minute or two.

The firm were well satisfied with the temperature uniformity of the stock, the total charge being 70 tons, consisting of stock and casing. The firm proposes to convert three more of their ovens from producer-gas firing to oil-gas firing.

Société Lorraine-Escaut, Valenciennes

The plant seen at this works is a continuous bogie furnace used for heating steel ingots to 1,250 deg. C., prior to piercing for production of solid drawn tubes. The furnace is 150-ft. long, and was originally designed for oil firing with provision for possible future firing by producer gas, the firing zone being approximately 75-ft. long, having 21 gas ports each side. The furnace had not been fired by producer gas and prior to conversion to oil-gas firing was fired by conventional medium-pressure oil-burners (atomizing air 15 lb. per sq. in. pressure), when the furnace output was 22 tons per hr.

The main gasifier was of approximately 250 gall. per hr. capacity and was located some 35 ft. from one side of the furnace, the gas being carried *via* underground flue and entering the furnace through the 42 existing ports. To maintain the charging end at operating temperature during shutdown periods (two-shift working), an additional gasifier was installed with a dual burner located at high level, firing into a combustion chamber situated above the normal roof level, the roof on either side being modified to facilitate flow of products of combustion into the stock. This gasifier is approx. 60 gall. per hr. capacity and by its inclusion the production rate has been increased to 27 tons per hour.

General Conclusions

From the visits to the two works, discussion with the operators and managements concerned, and also following meetings with officials of the *Office Central de Chauffe Rationelle*, the party summarized their findings somewhat as follows:—

They were impressed by the simplicity of the gasifier, its design, and ease of operation. They found that, from figures supplied, the claim of 98 per cent. thermal conversion was justified. Cleaning out is not required in the case of medium and large size gasifiers, and in the case of small units it takes only a minute or two. Regarding free carbon in the gas, this appears to burn off satisfactorily. In the case of the continuous bogie furnace at the second works visited, which has been fired by oil gas for about two years, the flues and plain tube recuperator are inspected annually and there have been no signs of sooting up.

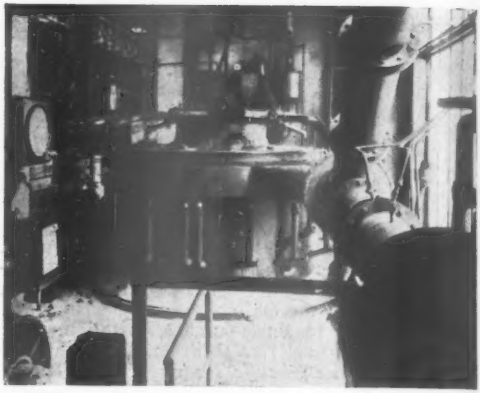


FIG. 2.—*Large gasifier at Société Lorraine-Escaut; 250 gall. per hr. max.*

The flame produced by oil gas is similar to that of a producer gas flame, and by design of burner and control of secondary air, the oil gas-flame can meet most requirements for high-temperature processes. Further, there are no serious problems with refractories associated with the gasifier or in its applications. The tuyeres are air cooled and made of heat-resisting steel their maintenance has been negligible. Any grade of fuel-oil can be used and the heaviest grade of fuel-oil, provided it is heated to the right viscosity, can be used on the smallest size of gasifier.

It is possible to extend the turn-down range of large-capacity gasifiers to 10:1 by suitable arrangement of the tuyeres and oil orifices. According to the results quoted there appears to be no change in gas composition over the turn-down range. The degree of control of furnace atmosphere with the oil gas produced by the gasifier is similar to that obtained with coke-oven gas and producer gas.

At the second works visited it was stated that with oil-gas firing there had been a considerable reduction in scale loss and an improvement in temperature uniformity. There was an improvement in the surface of the tubes produced. One of the claims of the inventors of the gasifier is that with oil gas, difficulties experienced with high-sulphur oil in conventional oil-firing, are eliminated or considerably reduced. Cases were quoted to the party where troubles attributed to high-sulphur oils had disappeared when the furnaces were converted to oil-gas firing. In one particular case quoted by *OCCR* it has been found possible to dispense with protective boxes for the heat treatment of turbine blades; in another, sulphur trouble experienced in heat-treating tool steel has been eliminated.

The party feels that the oil gasifier compares favourably with the normal producer and cites the

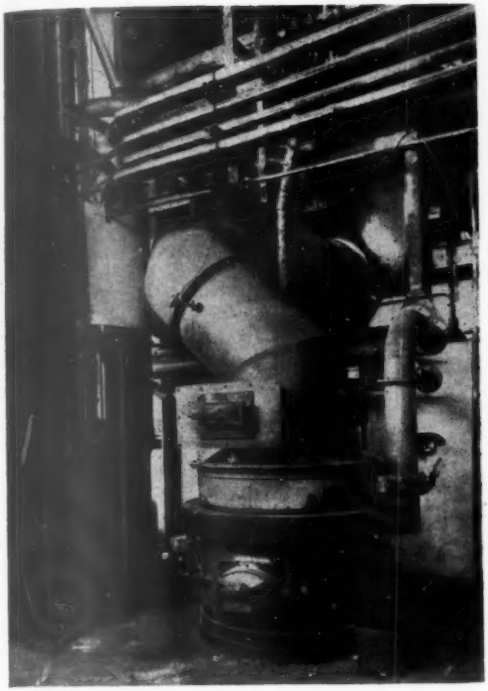


FIG. 3.—*Small gasifier at Société Lorraine-Escaut; 60 gall. per hr. max.*

following: —The cost of gas produced by the gasifier on a straight fuel-cost basis is approximately the same as for normal producer gas. Labour costs are considerably reduced. There are no tars present in oil gas and this obviates weekly burning out of mains. The plant is much smaller in size than normal producer machines and its capital costs are of the order of one-fifth those for normal producers of the same capacity. Due to the high temperature of the oil gas (1,200 deg. C.), it is not possible to have a central gasifier plant, but the advantage of having a gasifier per furnace with its own individual control, and also consideration of the space factor, should be borne in mind.

The party considers that there is considerable scope for the gasifier in the United Kingdom on high-temperature processes, such as reheating furnaces, glass pots and ceramic kilns. Special note should be made of the long lazy soft flame which can be produced with oil gas, which makes it eminently suitable, for example, for firing gas retort settings. Where at present town's gas is used on high temperature processes for reason of atmosphere control or temperature uniformity, then oil gas should be suitable for these purposes giving a reduction in fuel costs of the order of 50 per cent.

Brown, Lenox Anniversary

The opening of the new laboratories of Brown, Lenox & Company, Limited, at Pontypridd (Glam), by Sir George Briggs on June 12, will be a development in the history of the company which falls happily in the year that it is celebrating its 150th anniversary. The company traces its origin to 1806 and to its foundation by Lieut. Samuel Brown, RN, who was later knighted and a captain in the service.

Brown claimed the invention of the first wrought-iron chain cables ever to be used for practical purposes. He fitted out a vessel with her entire rigging of chain, and with chains for her cables, and sailed to the West Indies. A committee of Naval officers reported favourably on the subject and the Government ordered four warships to be fitted with Brown's chain cables. In the course of his manufacturing activities Lieut. Brown found himself in need of additional capital and a partnership was formed between him and Mr. Samuel Lenox, the firm thus becoming known as Samuel Brown, Lenox & Company. By 1816 chain cables were in general used by the Royal Navy, and the practice spread rapidly to other shipping.

At the beginning of 1812, works were erected at Millwall, London, but by 1816 the expansion of the firm's activities led it to seek a new site and the works at Pontypridd came into being. About seven years later Capt. Brown began to interest himself in the construction of suspension bridges. The next step in the company's history was the design and manufacture of permanent moorings for vessels, and the firm became the first manufacturers of iron buoys, while it also devised the "Admiralty" anchor. Sir Samuel Brown died in 1852, at the age of 76.

Twentieth-century Developments

Around the beginning of the twentieth century, the firm expanded its interests, and among other products it manufactured railway wagon volute and laminated springs, the steel for which was rolled in the company's own mills, and many of the requirements of collieries, of which pit trams or tubs were supplied in large numbers. At this time the company operated iron-rolling mills, cast-iron, crucible-steel, and brass foundries, and heavy forges in addition to the existing chain and smith departments. In 1922 a steelfoundry was built and in 1928 a patent was taken out for cast-steel cables. Only one other firm in the world—in the USA—has been approved by Lloyd's for the manufacture of cast-steel chain for ships' use.

The celebrations of the 150th anniversary also coincide with the decision to instal what is claimed as the largest mechanized chainmaking plant in the world. It is operated on "automative" lines and produces mild-steel chain at a speed of more than 20 times that possible by the old craft methods of making wrought-iron chain. This ASEA-SVETS plant is due to go into production in 1957.

(This firm is one of those to be visited during the conference of the Institute of British Foundrymen at Cardiff, and was briefly described in the JOURNAL, May 3 issue.)

SHEFFIELD UNIVERSITY COUNCIL, at its meeting on May 18, decided that the refractories section of the Department of Metallurgy should be created a separate Department of Refractories Technology with Professor J. White as its head. The Council received the resignation of Dr. G. B. Greenough, senior lecturer in physical metallurgy, on his appointment as a research manager to the Atomic Energy Authority at Windscale.

Reflection Electron Microscopy

For a paper entitled "Surface Examination by Reflection Electron Microscopy" by J. S. Halliday, PH.D., and presented to the Institution of Mechanical Engineers, the main features are covered by the following synopsis:—

In reflection electron microscopy, the surface is viewed very obliquely and the surface protuberances are seen in profile. It is shown that the method may be used for the quantitative study of surface finish. The method is particularly suitable for the examination of surfaces on which the irregularities are small—and ground, lapped, finely abraded and polished surfaces can conveniently be studied. Micrographs of various metals show that ground surfaces of comparable roughness may have different textures and these differences appear to be related to the mechanical properties of the metals. The range of surface finish which can be examined is illustrated in the paper by micrographs of electropolished aluminium which, over large areas, is flat to about 0.1 deg. and on which the highest asperity is 0.4 micro-inch, and of ground hardened tool steel with asperities up to 70 micro-inches high and sloping at 30 deg. to the general surface. The method is suitable for the examination of surface damage by wear processes and the surface damage on copper after passage of a steel slider is illustrated. Finally, the advantages of reflection electron microscopy over other methods of surface examination are discussed.

Cupola Charger Accident

None of them would ever know exactly how it was that a Bloxwich man came to be crushed by a cupola charger at a Willenhall foundry, the deputy coroner (Mr. W. B. C. Forsythe) told an inquest jury at Wolverhampton on May 10. The jury returned a verdict of "accidental death" on Thomas Russell (61), a labourer. A colleague, Thomas Sheahan, said that when the accident occurred at 2 p.m. on April 24, he was working with a shift of three, including Russell, loading scrap metal into the skip of the cupola charger. Sheahan put some coke into the skip and as he went away to collect another load he saw Russell climbing to the first platform of the plant to push down the metal in the skip. Only Russell worked the button which moved the skip. He saw the skip moving up, and, before anybody could do anything. Russell was crushed between it and the chute. There was a safety mechanism by which anybody who climbed the cupola could turn the current off, but he had not seen Russell use it.

A maintenance engineer said it was not possible for the skip to move unless somebody touched the button. The jury recommended that extra safety precautions be installed on the ledge where Russell was standing.

ECGD's Bradford Office Moves

The Export Credits Guarantee Department (the Government Department providing exporters with insurance against the major risks of export trading) announces that its Bradford office took over new premises at Britannia House, Bridge Street, Bradford, 1 (Bradford 25147) on May 28. This office covers west and south Yorkshire. Mr. M. C. Day, the local manager, states that his office is at present handling short-term policies with a face value of just over £100 millions; in addition ECGD covers just under £350,000 worth of medium-term business in the area.

New British Chemical Standards

Bureau of Analysed Samples, Limited, Middlesbrough, announce a new list of standard samples which includes the following additional items:—

B.C.S. No. 266 *Permanent-magnet alloy*, 13 per cent. Ni, 24 per cent. Co, and 1 per cent. Nb (complete analysis).

B.C.S. No. 174/1 *Basic slag*, complete analysis, including citric soluble P_2O_5; and

B.C.S. Nos 248 *and* 249 *Basic slags* for sulphur only—these latter samples are intended for standards for the determination of sulphur by combustion.

B.C.S. No. 268, 5 per cent. Silicon/aluminium alloy (complete analysis) near to B.S. 1490: LM16.

B.C.S. No. 269 Firebrick (34 per cent. alumina) (complete analysis)

S.S. Nos. 11-17 a Unique series of seven spectrographic standards of mild steels in the form of ¼-in. dia. rods containing increments of a large number of residual elements. Chemical standardization at present extends to the following percentage compositions:—Ni, 0.01 to 0.23; Cr, 0.02 to 0.18; Mo, 0.01 to 0.19; Cu, 0.01 to 0.21; W, 0.01 to 0.28; Co, 0.01 to 0.25 Sn,0.01 to 0.11; and V. 0.01 to 0.10. In due course it is hoped to standardize the following additional elements:—Ti, Al, Zr, Nb, Ta, Pb, B. This series is also available in the form of turnings which may be used as chemical or photometric standards.

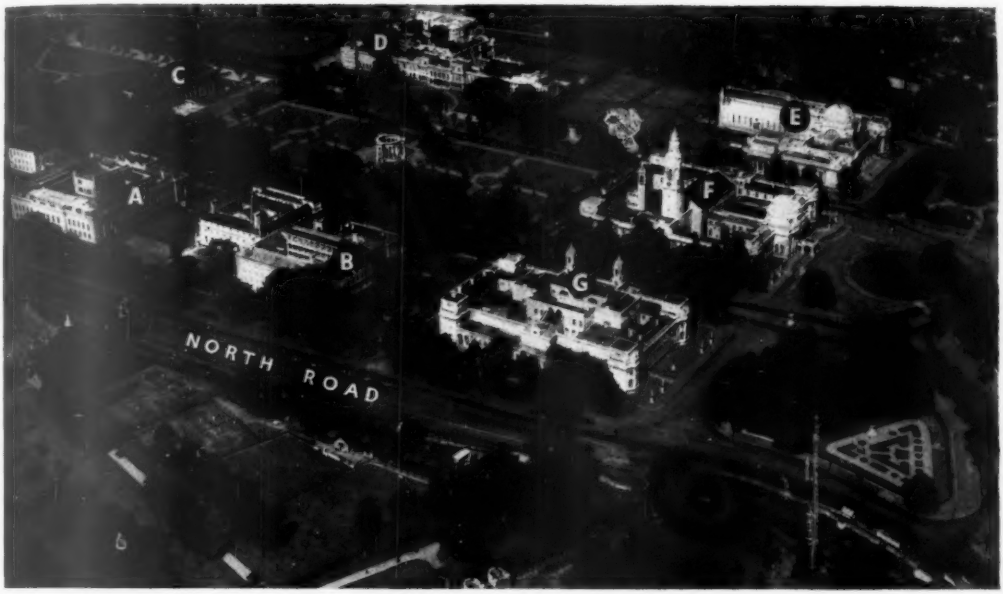
Copies of the new list may be obtained from the Bureau, at Newham Hall, Middlesbrough, Yorks.

"Key" to Cardiff

The following "key" applies to the aerial photographs of Cardiff city centre reproduced on the facing page, related to functions of the Institute of British Foundrymen at its annual conference, June 12 to 15:

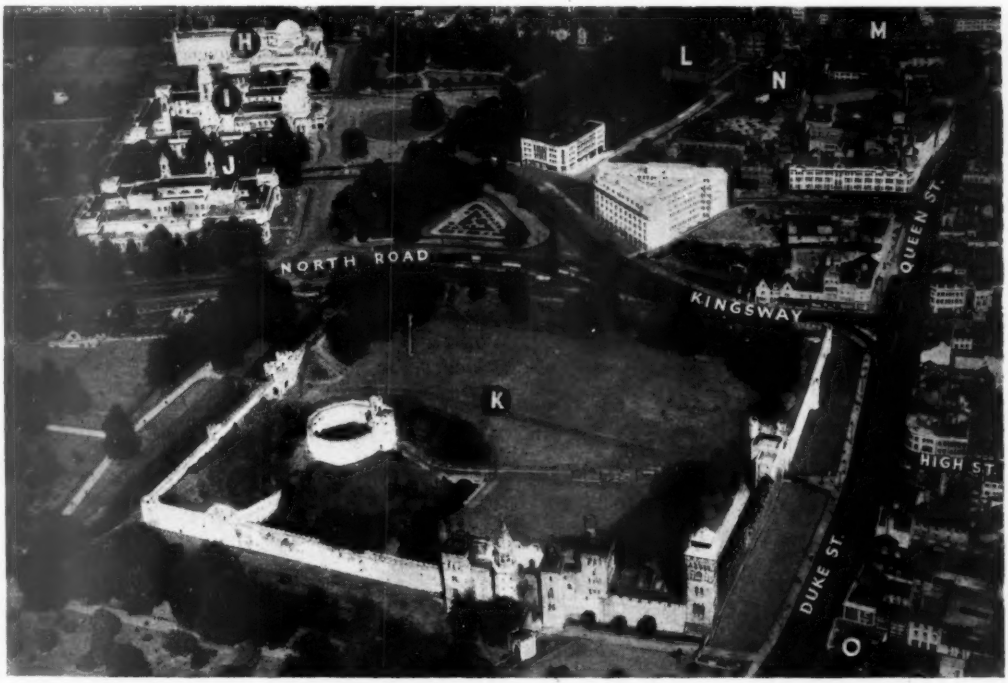
A. Technical College; B, County Hall; C, Welsh Board of Health; D, University College of Wales and Monmouthshire; E and H, National Museum of Wales (ladies' visit on Wednesday); F and I, City Hall (civic reception on Tuesday, president's reception and annual banquet on Wednesday, and dinner/dance on Friday); G and J, Law Courts; K, Castle and grounds (ladies' visit on Wednesday); L, New Theatre (party visit on Thursday); M, Park Hotel (Council and committee meetings on Tuesday, annual general meeting, Edward Williams' lecture and luncheon on Wednesday); N, South Wales Institute of Engineers (conference office and all technical sessions); and O, Angel Hotel (ladies' reception by Mrs. H. J. V. Williams on Tuesday). In St. Mary Street, the continuation of High Street (lower illustration), are the Royal Hotel (luncheon on Thursday), Queens' Hotel and fashion theatre of James Howell & Company, Limited (ladies' hairdressing demonstration on Wednesday). Parking is available at the rear of the New Theatre and there is a garage adjoining the Park Hotel.

AT THE ANNUAL GENERAL MEETING of Joshua Bigwood & Son, Limited, in Wolverhampton, on May 25, the chairman and managing director, Mr. H. R. Rowbotham, said that the company's foundry has been closed because it became apparent that the requirements for grey-iron castings were steadily diminishing, due to the trend of customer demand, especially abroad, for increased use of steel weldments. Mr. Rowbotham also claimed that a high-speed tube-straightening machine supplied by the company to an important steel works in Scotland, is the largest yet built in this country, and it can deal with 50-ft. lengths of tube of diameters up to 15 in. and wall-thicknesses of ½ in



Views of the centre of Cardiff showing some of the principal thoroughfares, civic buildings, hotels, etc., in relation to the forthcoming conference of the Institute of British Foundrymen, June 12 to 15 (*see "key" on facing page*).

(*Air photos by Donovan C. Wilson, A.I.B.P., Hereford.*)



Technical Training "In Depth"

Addressing the annual convention of the Yorkshire Council of Further Education, attended by some 150 delegates at Leeds, Lord Hives, chairman of Rolls-Royce, Limited, and chairman of the newly-formed National Council for Technical Awards, spoke on "A new advance in technical education." He said that intelligent youngsters were not in short supply: if good use had been made of the human resources available there would have been less difficulty to-day. Throughout history human societies had managed to be extremely wasteful of individual talent, and the discovery and nurture of talent had been largely accidental. In the past the need of society had put no premium on either gifts or training. Even a generation ago the world did not reckon highly-intelligent and trained men to be the most marketable commodity, but now, for the first time in history, a radically different condition existed. The nation badly needed its talented and highly-trained men and women—and not just creative scientists of a Nobel Prize level. Behind such scientists moved an army of superbly trained men to test, confirm or reject new discoveries, and besides them an immense corps of trained laboratory assistants and mechanics. A similar situation existed in the industrial field where the spotlights shone on designers, inventors and improvers, yet behind them were technically brilliant men to put their ideas into operation, and at the back again highly-trained technicians and mechanics. Lord Hives said that only in recent years had we learnt that much of the strength and vitality of our technicology was dependent on this "training in depth." Unless suitable steps were taken the demand for highly-trained men and women could not be met, for we were facing not a shortage of talent as such but a shortage of trained talent. The new-look technologist could not be drawn exclusively from our present grammar schools, but a hopeful and very useful type of education was developing in technical secondary modern schools. Such schools did not neglect pure science but gave scope for studying the application of science, especially in relation to local industries—such as building, textiles and engineering. Expressing his approval of the early acquirement of some practical skill and experience, Lord Hives said that through technical secondary schools it was important that young people should feel something of the fascination of technology. He did not wish to see in those schools the same kind of early specialization that university requirements had hitherto forced on grammar schools. He would rather see more subjects than that a few subjects should be intensively studied—anything that would give a wide outlook and develop common sense.

Talent Wasted

He gave a warning that talent was being wasted in all schools, but especially in technical and secondary modern schools, partly due to selection—with some pupils being put into courses unsuitable to their capacities—but largely because there were not facilities in technical and secondary modern schools for continuing education beyond the normal school-leaving age; in other words there were few facilities for sixth form work. The position was also vitally affected by the supply of suitable teachers, for, obviously, without highly-qualified teachers it was impossible to increase higher courses. While discussing "training in depth," Lord Hives said that any person who had not achieved the highest award had by no means failed on a broad basis. It was desirable that persons with exceptional gifts should be recognized, but to be effective they would always need support from highly trained technicians.

Smokeless Fuel Research

Mr. R. H. Rowse, of Smith & Wellstood, Limited, Bonnybridge, representing the British Ironfounders Association, told 200 delegates at a one-day conference in Glasgow on May 24, organized by the Scottish Committee of the CUC, that in recent years the continuous-burning fire had gained a considerable degree of popularity. "Its advantage is in its ability to burn satisfactorily a wide variety of fuels, including smokeless fuels, and its ability to stay alight overnight," he said. "As a nation we are now beginning at long last to appreciate the advantage of having adequate supplies of hot water available in our homes, and for an ample supply at low cost solid fuel is the only answer. Modern thermostatically-controlled boilers are attractive in appearance and easy to keep clean. Refuelling is required only two or three times a day and overnight burning is taken as a matter of course."

In the discussion of smokeless fuel, Mr. J. Henderson Stewart, Joint Parliamentary Under-Secretary of State for Scotland, said it was now established beyond doubt that large quantities of coal were wasted in old-fashioned grates, stoves, boilers and kitchen grates. Somehow it must be stopped and it was the purpose of the CUC to undertake that task. The assault upon public opinion was now prepared: the conference, he hoped, would set it in motion.

Mr. R. W. Parker, chairman of the Scottish Division of the NCB, dealt with mechanization and modern coal preparation, and referred to a pilot plant which might be started in England to try to produce a smokeless fuel, which would be marketed as a commercial proposition. He said that much was being done but the commercial stage had not yet been reached. There was still the highly experimental job of making smokeless fuel out of bituminous fuel, and these experiments were going on. So far as clean air was concerned, Mr. Parker said that there was no use in creating smokeless zones unless the smokeless fuel was available. The Scottish Division were pursuing the problem of producing a "carbonized ovoid" vigorously and might have success yet. Success meant not only producing the right product, but also producing it at a price which was reasonable in comparison with other fuels.

Steel Output and Deliveries

Steel production in April was at the rate of 421,100 tons a week, compared with 393,300 tons in April, 1955, when production was also affected by the Easter holiday.

The following table gives the latest steel and pig-iron output figures (in tons) and compares them with earlier returns:—

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1956—February ..	263,300	13,692,000	417,800	21,724,000
March ..	262,000	13,624,000	425,800	22,141,000
April ..	254,300	13,225,000	421,100	21,896,000
1955—February ..	241,700	12,567,000	394,200	20,498,000
March ..	240,700	12,516,000	394,900	20,536,000
April ..	238,500	12,401,000	393,300	20,455,000

PRELIMINARY PLANS have been drawn up to convert The Mount, a classical mansion at Broomhill, Sheffield, into headquarters for the United Steel Companies, Limited.

Report on a Study Tour of French Patternshops

*By L. Brown and B. Levy**

The first international study tour connected with patternmaking ever to be undertaken, was the visit by a party of members of the National Society of Master Patternmakers to the Paris region. The tour was most efficiently organized by the opposite French Society, the *Chambre Syndical des Patrons Modeleurs-Mecaniciens* (*de la Region Parisienne*). It consisted of visits to nine typical French master patternshops, a visit to the *Centre Technique des Industries de la Fonderie*, and to the Renault plant —all completed in a " week-end " of four days, one of which, Sunday, was reserved for rest and sight-seeing. The major event of the social side of the tour was a dinner on the Friday evening, when the French hosts with their ladies generously entertained the British visitors at the Hotel Lutetia.

Robert, of Courbevoie

The first concern to be visited was that of Robert, of Courbevoie where approximately 25 men were employed. It was noted that the predominating wood used at this and other patternshops (visited later) for hardwood patterns and coreboxes was French walnut. Enquiries concerning the preference for this material produced the information that although the walnut was expensive, costing the patternmaker approximately £60 per cubic metre (roughly equivalent to 34s. per cub. ft.), the alternative of importing mahogany was likely to be still more costly to the French—evidently the use of imported timbers was not encouraged whilst any kind of suitable home-grown timber was available. At this works, but not at all other establishments, there were a number of sets of turning tools and a proportion of other edge-tools and saws provided by the firm for the operatives' use. The greater proportion of working area at this works was allocated to wooden pattern equipment, with a separate department consisting of a small machine-shop which was employed on metal-pattern equipment of the part-machined and part-cleaned-up kind.

Finish and workmanship of the wooden equipment was first-class and a notable feature was the use of aluminium anti-core-crush beading on the coreprints of all suitable-size and suitable-type wooden patterns. The machinery used in the woodshop was commonplace enough except for the wood-turning lathes where a knife-contact switch directly coupled to a brake on the driving-pulley was demonstrated. The arrangement which undoubtedly was quite effective in obtaining quick stopping and starting of work, would certainly be severely frowned upon by British Factory Inspectors and indeed it is doubtful whether any of the electric power supply authorities in this country would consent to such an arrangement owing to the obvious fire and other dangers involved. However, this did not seem to have been as dangerous in actual working as it appeared in the rigging-up, since the contrivance had obviously been in use for some considerable time.

A. Voisin, of Puteaux

The works of A. Voisin at Puteaux was in a completely different category from the first described, since here the major business was in metal equipment, covering a variety of metal patterns and coreboxes, gravity- and pressure-dies, and press tools, also the manufacture of the firm's own die-casting machine. The system of working all jobs through the factory was operated by the employment of draughtsmen to plan and layout every item, even including production charts, and indexes for milling contours and irregular shapes. This method resulted in the majority of the 93 metal-working men being in the class of machinists or bench fitters and on approximately three-quarters of the pay-rate of the few higher-skilled wooden-pattern makers employed by this company. A noteworthy point in the running of the machinery was that one young man was operating two Keller-type machines.

The general standard of equipment, machinery in use, methods, and products, were all of the highest class and quality, and it was considered by all the visitors that this company was to be congratulated on producing the quality of cast-iron and steel patterns, dies and other equipment seen in progress.

Couffinhal, of Colombes

The firm of Couffinhal at Colombes was the third works to be visited and again a completely different set-up from the two previous firms was apparent. Unlike the previous premises, here there was plenty of space to spare, with a separate joinery or mill, and timber shed. For the first time some mahogany was in evidence, although the majority of the work seen was manufactured from Oregon pine or similar material. Some neat wooden models were on view, and it was also interesting to note the use of plaster moulds and cores for checking the pattern equipment produced here. A small amount of metal-pattern equipment was being manufactured with the aid and installation of two first-class universal milling machines. In the wood-mill a fair amount of joinery and a little furniture-making was being put through, together with a small quantity of repetition woodwork. Versatility seemed to be the key-note of this establishment.

Retout, of Paris

The first of the afternoon visits was to the plant of Retout, of Paris, who were largely concerned with pattern equipment for press tools such as used for car bodies, etc. A prominent feature of construction was the employment of lock-joints for frames

* The Authors are president and past-president of the National Society of Master Patternmakers, respectively.

Study Tour of French Patternshops

and tongued-and-grooved timbering for external facing-boards. The materials this firm had in common use were of the Oregon-pine type, and home-grown lime. A feature which gave rise to comment by the visitors was the unusual arrangement for moulding of the large press-tool patterns. This did not appear to be in line with accepted and general methods employed by British foundries and patternshops. A separate " metal " shop appeared to be engaged mainly on the production of gravity dies.

At Alfred Duifour, of Montrouge (Seine), the main features noticeable were the use of oak for patterns and coreboxes, and the fact that the firm made their own tongued-and-grooved boarding on spindle-moulder machines. Building patterns with the tongued-and-grooved boarding again was in standard use, although there were instances where this practice did not seem to have any obvious advantage, in view of the trouble taken to apply the method.

Nicault et Fils, of Bagnobt (Seine)

At Nicault et Fils of Bagnobt (Seine) the great majority of work was centered on wooden pattern equipment, with accent on the larger type. Construction and workmanship was very good indeed and materials were again a type of Oregon pine and French walnut. A different and pleasing feature in this plant was that all benches, machines and fittings were painted blue and the rest of the factory cream. Machinery here was quite up-to-date and the visitors were informed that the firm were considering starting a metal-patternmaking department. A machine tool by Bohner and Kohle attracted admiration and it was thought that some of its desirable features might be incorporated in our more popular Wadkin pattern miller. Another noteworthy point was the provision of a separate clothes locker with lock and key for each man.*

Koller Pere et Fils, at Saint Ouen

The concern of Koller Pere et Fils at Saint Ouen was engaged on similar large press-tool work to that viewed at some previous patternshops. The methods and materials were similar to the other French patternmakers with the addition of cellulose spraying of their smaller patterns. This factory was recently rebuilt and laid out in an orderly fashion. It was noticed that pattern machinery of British manufacture was in use and the hosts reported great satisfaction with the performance of this plant. A gallery above the main floor of this building was utilized for large layout- or drawing-boards vertically arranged, and for a few small machines. The office accommodation was also on the same upper level.

Lucas à Judas at Saint-Denis (Seine)

The firm of Lucas à Judas at Saint-Denis (Seine), was visited on the Saturday morning and only the firm's metal-pattern makers, who were on overtime, were then working. This plant was clean and well arranged, its activities embraced both wood- and metal-pattern equipment with emphasis on aluminium. It was noticed that no metal harder than aluminium was worked here although a Gambin Miller—a first-class machine-tool—had been installed. A unique feature of this Gambin machine was the drive arrangement to a fully universal working head.

The firm operates a small non-ferrous foundry in a separate department on the site, which is mainly for casting aluminium patterns, coreboxes and core-carriers, for their own work. The metal used appeared to be rather softer than the various grades of aluminium available in the United Kingdom, but despite this, a first-class finish was obtained on all the equipment shown and in hand.

Leger et Cie, at St. Denis

The last patternshop to be visited was that of Leger et Cie at Saint Denis where the visitors were shown some developments of epoxy-resin pattern equipment. A set of water-valve patterns had been reproduced very cleanly and sharp in detail by the following method:—The master pattern was first sprayed with an epoxy-resin mix or paint, after which it was invested with plaster. Evidently the coating of spray given to the pattern adhered to the plaster yet parted readily from the pattern. From these plaster moulds, recasts were then made, with epoxy-resin mixes. Another development seen was a Keller model for a car body which had been rigged by first building a metal framework of angle-iron; fitting thereon a rough wooden shape formed in skeleton style, then pouring plaster to a near-finish shape and finally finishing with a thin layer of synthetic resin.

In addition to these activities a small amount of metal-pattern work was being dealt with which seemed to be related rather to press tools. A small press with an electrically-heated platen had been installed and the visitors were shown a small component which had been produced off tools made, and still in the course of development, by this firm for plastics production.

Patternmaking School

At the *Ecole Diderot*, a very large room fitted up completely with benches for approximately 30 student patternmakers, and a comprehensive range of patternshop machinery, was of outstanding interest. The visitors were informed that this school was one of ten such establishments in the Paris area and that parents are quite prepared to send boys to put in a full-time course of some three or four years to learn patternmaking, without any subsistence allowance, excepting only in very extreme cases. Both the standard of training and the resultant trainee appeared to be very good indeed, and in viewing a wide range of patterns made by the students it was evident that practical results were the " acid " test, and proof of the soundness of this system for training craftsmen. French employers voiced their praise of the quality of craftsmen turned out by this method and reported that these young men were in great demand. This was not

* This is the usual practice for French industry—Editor.

surprising in the light of the excellent specimens of handicraft displayed.

Centre Technique

A party of the French master patternmakers joined the British when visiting the *Centre Technique des Industries de la Fonderie*. This was full of interest for the visitors, the director of research opening the visit by first giving a comprehensive survey of the function and activities covered, together with a word picture of the way in which the *Centre* operates. Points were made regarding the importance of good pattern equipment, including the fact that foundries in France mostly purchase their equipment from outside patternshops and seldom operate more than a maintenance patternshop of their own. Co-operation between patternmaker and foundry was fostered by the *Centre Technique*, and it was agreed by all that buying pattern equipment on a price-only standard was too frequently the cause of trouble. The facilities available at the Foundry Centre for service to the whole of the French foundry industry are most up-to-date and complete, including an experimental foundry, laboratories for physics, chemistry, mechanical tests and domestic heating.

Renault Plant

To the party, the Renault plant was a little disappointing since the party were given much information regarding the factory as a whole, but while they were shown the wood-pattern shop, the metal-pattern side, which would have been of greater interest, was not open to them.

Upon entering the main hall of the office building the first show-case to be seen by the visitors contained an assortment of wooden patterns mostly of walnut which apparently had been made by various patternmaker-apprentices of the firm. Following this unusual display of the patternmakers talents, a few enquiries brought the information that not only do Renault think highly of their patternmakers, they accord them the highest rates for labour in their plant.

In the foundry the general trend appeared to be on partial rather than full mechanization and no labour shortage seemed apparent—on the contrary a rather overpowering squad of men were operating a large eight-stage Osborn coreblowing machine. Metal handling and mould-pouring was on a light hand-operated overhead rail in conjunction with a pallet-type conveyor. Cylinder-block castings were knocked-out red-hot and thrown in heaps outside the foundry for conveyance after cooling to the fettling shops. The wood-pattern shop was equipped with machinery that appeared to be rather old and well-worn, with the only noticeable feature of power-feed on the rotary table of the pattern-milling machine.

A rather interesting specimen corebox was observed, which, it was understood, was still only in the experimental stage. This corebox was made of a mix including an epoxy-resin and metal powder, giving a metallic finish. There had been some reinforcement with metal ribbing. The structure was obviously an outer casing to house the working parts of what presumably was a cylinder head or block, jacket core. The wooden patterns in hand were similar in class and quality to those seen in the master patternshops.

Conclusions to be drawn from the tour as a whole are mainly as follow:—

(1) The standard of wooden-pattern making in France is very good indeed.

(2) The material (timber) used varies widely and appears to be based on what may be available rather than what is desirable.

(3) Craftsmanship generally is first-class.

(4) Costs and charges compare evenly as a whole with the United Kingdom, with a leaning towards the higher side in France.

(5) There appeared to be considerably less pattern-work performed on the harder metals, such as cast-iron and steel, as compared to the United Kingdom.

(6) Electrical installations, such as works wiring, switches, etc., appeared to be on a somewhat free-and-easy style compared to the minimum essential standard in Great Britain.

(7) Craft or apprentice training receives a great deal more government or municipal support and backing than in Great Britain and is not left so much to the industry.

(8) Greater use is made of centralized information, mainly through the *Centre Technique*.

In closing this report, it is the pleasure of the Authors to record the sincere thanks of the National Society of Master Patternmakers to the *Chambre Syndicale de la Region Parisienne*, and other organizations which contributed so much to the success of this tour, with particular mention of the individual proprietors of the French patternshops who excelled with their generous and spontaneous hospitality. The National Society of Master Patternmakers looks forward to reciprocating in due course, so that this international co-operation and good feeling will continue progressively.

Meehanite in South Africa

The sixteenth annual meeting of the Meehanite Metal Research and Development Association of Southern Africa was held under the chairmanship of Mr. A. G. L. Lewis, in Johannesburg, on March 21 and 22. A unique feature was that all papers were recorded and presented on tape. Subjects dealt with included basic-cupola operation, production of ductile types of Meehanite metals, the CO_2 Process, the use of alkalis to improve moulding sands, and foundry cost-control methods. Meehanite (Africa) (Pty.) Limited, announce a servicing agreement with W. S. Craster Limited.

Hungary's Five-year Plan

As part of a five-year plan, shortly to be placed before the Hungarian Parliament, it is proposed to raise metallurgical production by 40 per cent. by 1960, at an estimated cost of £90,000,000. The project includes the starting up at Sztálinváros of two new open-hearth furnaces, two coking plants, a hot and a cold rolling mill, and No. 2 blast furnace; the modernization of the Lenin metallurgical works at Diósgyör; mechanization of blast-furnace charging in the iron industry; and the raising of aluminium production to 47,500 tons.

New Catalogues

Roof Extraction Unit. A four-page leaflet received from Phoenix Heating, Limited, 17, High Street, Egham, Surrey, illustrates and details a new type of ventilator, made of indestructible glass fibre for mounting on shop roofs. It is available in four sizes ranging from 12- to 24-in. fan diameter, with sub-divisions for various fan speeds. Copies of the leaflet are obtainable on writing to Egham.

Process Heating Appliances. Barlow-Whitney, Limited, 2, Dorset Square, London, N.W.1, have used a 16-page well-illustrated brochure to describe a wide range of electrically-heated apparatus. The first item for consideration is a line of glue pots which includes water-jacketed, plain, and multiple units. Other items of foundry interest are a series of hot-plates, tinning and melting pots, soldering outfits, muffles, and air heaters. This interesting brochure may be obtained by writing to Dorset Square.

Strainer Cores. Allan Levin, Limited, 4, Drapers Gardens, Throgmorton Avenue, London, E.C.2, in a stiff-paper two-leaf folder, illustrate the standard sizes of IFO Cordierite strainer cores including both circular and rectangular shapes. On the back page is an interesting alignment chart, correlating the volume of metal passed at various head pressures. These strainer cores which are made in Sweden are pressure moulded. All this information is available on writing to Drapers Gardens.

Silica Sand. A modest but extremely useful four-page leaflet has been issued by the Ryarsh Brick and Sand Company, Limited, of West Malling, Kent, covering the silica sand produced from their quarries. The chemical composition, sieve grading, and refractoriness are detailed, whilst typical mixtures are given, and test values quoted for different types of core sands and for synthetic moulding sands. The applicability of the sand for the CO_2 and shell-moulding processes is detailed. The leaflet is available to readers on writing to West Malling.

Shell Coreblowing. Industrial Foundry Materials, Limited, Dudley Road, Lye, near Stourbridge, have issued a leaflet covering the L14 shell coreblower. It takes the form of posing and answering 20 questions about the machine. Though the leaflet covers only the L14 machine, it is understood there is now a second one—the DL14—which is a double machine, with the controls on each half duplicated so that each may operate at different timing and pressures. Both can be operated with an electronic self-zeroing timing push-button control. Those interested should write to Lye for a copy of the leaflet.

Foundry Plant. Carrying the title "F.E. Know-How," Foundry Equipment, Limited, Linslade Works, Leighton Buzzard, have issued a leaflet of a general character. It gives details, with illustrations, of various installations they have made throughout the world, and, very shortly, too briefly to our mind, indicates the extent of the works which manufacture this plant. This criticism is, however, somewhat nullified by the invitation contained for readers to visit Linslade Works. The number of employees could have been included as a reliable key to the size of the works, as it must now rank amongst the largest in Europe. The leaflet is available to readers on applying to Linslade Works.

Notes from the Branches

South Africa

Two meetings of the South African branch of the Institute of British Foundrymen were held in the month of March. At the first, on March 7, members and friends saw "The Wheel," a film which dealt with pressure pouring of carbon steel in graphite moulds for railway car wheels. Mr. J. A. de Kiewet, the president, was in the chair, and the film was introduced by Mr. Edward Q. Sylvester, president of the Griffon Wheel Company, USA. The second meeting took the form of a social evening, when Mr. de Kiewet presented a "travelogue" of his recent visit to Europe and the United States of America. The April meeting was held on the 26th, when a lecture prepared by Mr. K. H. Coombs and entitled "Causes and Remedies of Hard Edges in Light Grey-iron Castings," was presented by Mr. G. Dibden. In the course of the lecture, it was suggested that the determination of the causes of hard edges could be found rapidly by referring to the following procedure summary: (1) Determine the sulphur: manganese ratio: (2) determine the Carbon Equivalent of the iron; and (3) check (*a*) the iron for chromium content, (*b*) cupola practice to determine metal temperature, fluidity and degree of oxidation, (*c*) moisture content of facing sand and (*d*) foundry moulding practice. The subsequent discussion proved that there was a great deal of interest in this problem, and the Author was congratulated on the concise manner in which the Paper had been presented. In the vote of thanks, Mr. H. A. Godwin complimented Mr. Dibden on the handling of a paper not his own.

Australian (Victoria)

The March meeting of the Australian (Victoria) branch was devoted to the showing of a series of technical films. Amongst these were "Preparing a Cupola for Charging" and "S.-g. Cast Iron." The showing was followed by a discussion, after which supper was served.

Three papers by young associate members were presented at the meeting on April 18, at the Metallurgy Theatre, Royal Melbourne Technical College. "The Laying-out of a Moulding Pit" was the subject chosen by Mr. G. Evans (McPherson's, Limited, M.T.W. Foundry); Mr. R. Jurss (Harland & May) presented "Characteristics of Green-sand Moulding"; and Mr. G. Hellyer, of A. W. Bell, contributed the "Manufacture of Pattern Equipment for a Three-quarter-inch Tap."

He Runs to Work in the Foundry!

A 30-year-old employee in the Farington Foundry of Leyland Motors, Limited, Mr. Fred Yates, runs seven miles to work each day, although he lives less than a mile from the foundry. Mr. Yates is a marathon runner and to keep fit covers at least 14 miles a day, to and from work, by going the long way round. Wearing running shorts and vest, he leaves home at 6.20 a.m. to start work at 7.30 a.m. Mr. Yates takes full advantage of the work's shower-baths and contends that after a morning shower he is much fresher for his work than many of his workmates who travel by bus. As a member of Leyland Motors Social and Athletic Club, he has taken part in a number of cross-country races, particularly in Lancashire, won a number of prizes, and has competed twice in the 26-mile marathon events at Sheffield.

Equipment and Supplies

Diesel/Electric Locomotive

The huge amount of material to be transported to, from and in steelworks may be judged from the following figures for the Appleby-Frodingham Steel Company. The following approximate quantities are handled *per week:*—Local ore, 60,000 tons; Northants ore, 30,000; coke, 12,000; oven coal, 20,000; iron make, 25,000; blast-furnace slag, 30,000; ingot make, Appleby 14,500, Frodingham 5,600; finished steel, 18,500; rough coal, 650; other items (sinter, raw material, etc.) amount to 90,000 tons, giving a total of the order of 300,000 tons of material to be moved in a week. For this purpose, the works has 42 steam locomotives in action (plus usually four in for overhaul), and now has added a new unit—a 400-h.p. diesel/electric shunting locomotive, the "Janus," built by Yorkshire Engine Company, Limited. Comparison of its capabilities with well-established steam locomotives has created much interest in the iron and steel industry.

The "Janus" was developed in collaboration with the British Thomson-Houston Company, Limited, and is being produced in 200 h.p. and 400 h.p. versions. Both locomotives are fitted with Rolls-Royce diesel engines and B.T.-H. transmission, and are complementary to each other in that the equipment of the 400-h.p. model merely duplicates that of the less powerful locomotive, *e.g.*, there are two 200-h.p. diesel engines instead of one. The locomotive can operate on any one of its two engines if desired, or use both together.

By adopting the comparatively new 200-h.p. Rolls-Royce oil engine, which is in the automotive range, the "Janus" is provided with an engine generator set considerably smaller than is typical in installations of this horse-power. This has important implications—it reduces both first cost and maintenance, and enables a smaller bonnet to be fitted, thus improving visibility from the locomotive cab. Probably no other shunting locomotive available to-day gives the driver such a good all-round view, facilitating operations—and improving the safety factor—in crowded industrial surroundings.

The main particulars of the locomotive are as follow:—Weight, 48 tons; tractive effort, at start, 30,000 lb.; speed at continuous rating, 8 m.p.h.; tractive effort at continuous rating, 13,100 lb.; maximum permissible speed, 23 m.p.h.; can negotiate curves of 120 ft. radius and has a fuel tank capacity of 400 gal., sufficient for about one week's normal operation on two shifts.

Ferrite-estimation Apparatus

Austenitic weld metals, when deposited under conditions of restraint, are susceptible to hot cracking. Consequently a small proportion of ferrite is necessary in their structure to counteract this danger. But if this percentage is too great, the metal is unduly embrittled if maintained for any length of time in that range of temperature in which ferrite transforms to stigma.

In the past, the only method of checking the percentage of ferrite in a metal of this nature has been by rather laborious laboratory tests, in themselves time-consuming and not of immediate use to a welding engineer, metallurgist, or store-keeper who requires a rapid check. Recently a new method of checking the ferrite contents of welds, and of rods, sheets and fabricated components has been developed. It consists of a modification of a device manufactured by the East Lancashire Chemical Company, Limited. This device is known as the Elcometer and was originally developed for measuring the thickness of non-magnetic layers (such as paint, plastic coatings, etc.) on magnetic surfaces. It is a pocket-sized instrument operating on the principle that the increase of magnetic flux intensity between two soft-iron test probes of a U-shaped magnetic circuit reduces the forces on a spring-loaded magnetic needle in a parallel magnetic branch.

For the measurement of ferrite content in an austenitic metal, the tension of the spring is adjusted so the needle on the scale gives a reading corresponding to the ferrite content of reference sample. Although the readings obtained are not as strictly accurate as those obtained by the lengthy laboratory tests, they are sufficiently so to be of immediate practical value to the welding engineer. Further information can be obtained from the company, at Fairfield, Manchester.

Pneumatic Grab for Clearing Dry-sand Moulds

A new automatic air-operated grab has been produced in Germany for the clearing of dry-sand moulds for heavy machine castings, such as machine-tool beds. Owing to its heavy weight and high closing power, the grab is capable of excavating dry sand, without loosening it previously by means of a pneumatic spade. It is claimed that tramp iron in the sand does not interfere with its function, or is it affected by heat or dust. The grab (Fig. 1), designed by DEMAG Greiferfabrik, DEMAG A.G., Wolfgang-Reuter-Platz, Duisburg, 22a, Germany, can do work which formerly took four men six hours, in 30 min. with two men (including the crane driver), causing much less fatigue and risk of occupational disease. The troublesome effects of heat and dust on operators caused by the former method, where it was necessary to work with pneumatic spaders, are eliminated.

FIG. 1.—*German pneumatic grab for clearing dry-sand moulds. It is claimed that the robust construction permits its use without preliminary loosening of the sand.*

Equipment and Supplies

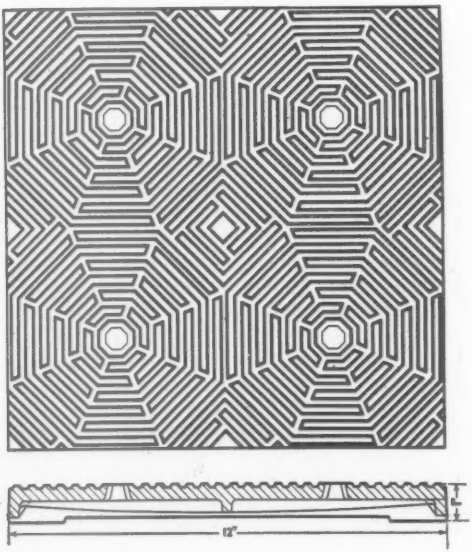
Large Shell-moulding Machine

What is claimed to be the world's largest shell-moulding machine—pattern size 36 by 36 in.—has been installed in the steel foundry of the National Tube Division of the U.S. Steel Corporation, Ellwood City, Pa., USA. The two-station unit will produce steel castings up to 34 in. and smaller castings arranged in multiple fashion on the pattern-plates. The new machine, model HOM-10, carries the largest pattern frames yet produced by Shalco Engineering Corporation. The unit is 18-ft. long and weighs over 4 tons. The machine incorporates hydraulic motors to invert the patternplates and dump boxes during the investment cycle. The oven is moved back and forth for the curing cycle by means of electric power, whilst shell ejection is accomplished by means of two hydraulically-powered plates. Both pattern and oven are electrically heated, in such a manner as to provide continuous heat to the pattern throughout the entire moulding cycle. The machine is said to produce 70 shells or 35 complete moulds per hour. The first patterns installed on the new machine at National Tube were for the production of steel piercing-dies for pipe manufacture, weighing 720 lb. after removal of gates and runners.

Industrial Flooring for Heavy Duty

To meet heavy wear and tear on floors in works and factories, W. T. Henley's Telegraph Works Company, Limited, 51/53, Hatton Garden, London, E.C.1, has introduced "Mettaflor," a permanent heavy-duty flooring. It effectively resists the effects of abrasion, impact, heavy traffic, and other conditions of severe usage. The striated pattern of the surface provides a maximum resistance to slipping under wet or greasy conditions. The flooring is easy to lay and is claimed to be impervious to the action of fats, salts, alkalis, etc., and when properly laid is said to possess all the good corrosion-resistant properties of cast iron.

FIG. 2.—*Plan and section of "Mettaflor."*



"Mettaflor" consists of square cast-iron plates, the upper surface having the striated design shown in Fig. 2, while the undersides are heavily ribbed to ensure adequate strength. Vent holes prevent the entrapment of air while the plates are being laid and ensure that the plates are solidly bedded. The standard size of the plates is 12 by 12 in. If staggered joints are desired, and to arrange for a surface to be covered to within the nearest 6 in., plates 12 by 6 in. and 6-in. square are also available.

The plates are easy to instal—the concrete sub-floor is cleaned free from dust and slightly wetted; a bedding of 1:3 cement mortar mixed to a stiff plastic state is then laid to a thickness of 1½ in. and screeded; the plates, which should closely butt together, are then solidly bedded into the mortar by tamping to ensure that no air spaces remain underneath the plates; the surplus mortar of the bedding exudes from the vent holes.

Precision Mixer

An entirely new type of mixing machine is now in production at the Morton Machine Company, Limited, Glasgow Road, Wishaw, Scotland. Designed and developed in Germany, these machines range from laboratory models of one quart capacity to production machines with capacity of 5,500 gall. (880 cub. ft.). The new Lödige/Morton machine consists of a cylindrical mixing-vessel with a set of revolving shovels mounted on arms attached to a shaft. These shovels are double-plough shaped and designed so that the mix is thrown upwards and outwards which ensures that the materials are intermingled in space. In this way, the method differs from previous techniques based on forcing the ingredients against each other to achieve admixture. As the shovels pull the ingredients away from contact with the vessel, there is no possibility of any pressing action which might destroy their particle size. Due to the special shape of the shovels, even fibrous materials, which are particularly difficult to handle, can be mixed with a minimum amount of damage.

Speed Regulators

Baldwin Instrument Company, Limited, of Brooklands Works, Dartford, Kent, announce that five new speed regulators have now been added to their range of pneumatic equipment. The bore sizes are ⅛, ¼, ½, ¾ and 1 in. In most pneumatic installations, some means of controlling the speed of movement of the air cylinder is required. Furthermore, it is usually necessary for the speed to be different in each direction of movement. These speed regulators have been designed to screw into the exhaust ports of the directional control valve, thereby throttling the escape of air from the exhausting end of the air cylinder. This method of speed control is claimed to be preferable in all cases where steadiness of motion is important. The regulators are very compact and are made of nickel-plated brass; their maximum working pressure is 150 lb. per sq. in.

Creep-speed Device

Geo. W. King, Limited, Argyle Works, Stevenage, Herts, announce that creep speed is now available on their "My-Te-Min" and "Marvex" electric chain pulley blocks as an optional refinement, and will shortly be available for the "Matom." This will enable these blocks to be used in those many lifting conditions in the foundry, in which delicacy of performance and precision handling are essential.

Safe-working Hints for Die-casters

By Henry Allen

One of the most recurrent hazards in die-casting is the eruption of the metal under pressure from the die or machine, and each of the ways in which such an eruption can occur needs to be eradicated by the institution of proper safety measures. Metal escape may be caused, for instance, by the imperfect closure of the die. At casting temperature, most alloys are sufficiently fluid to enable them to flow through extremely narrow gaps (as narrow as 0.004 in.). If the gap between dies is greater than 0.008 in., the alloy may well travel over the die face while still molten and unless checked it can be projected in spray form for a considerable distance. Precision in setting dies is usually such that this hazard may never arise but often flakes of metal stick to the mating surfaces of the die blocks, preventing complete closure and causing metal cut out. Even a slight displacement of the die blocks may enlarge the adhering "flash" to a state in which molten metal can escape. One safety measure to prevent metal escape is to attach grooved baffles to one of the die blocks whereby a channel is formed adjacent to the joint-line of the die so that any metal escaping is stopped and chilled. A disadvantage of this technique is that it makes more difficult the cleaning of the die face. A second method is not to carry the vents to the edge of the die but to make them open into a vertical spew groove machined vertically down the die face. This method is effective so long as the gap between the die blocks does not exceed 0.010 in. The fitting of guards provides a third safety method and the best type on large machines is that actuated by a hydraulic or pneumatic cylinder, the valve of which is connected with the machine controls so that die closure is always accompanied by the advance of the guard in a closed position. In this case, an essential point to note is that the distance through which the guard travels, must always be greater than the stroke of the machine, thus fixed attachment of the guard to the moving platen is not possible because it prevents access to the die face.

Screens

Scroll screens arranged between die-casting machines comprise a final precaution against metal emission. A screen can also be mounted horizontally above the machine to good purpose to check metal thrown upwards and, generally speaking, the scroll type is better than a high sheet-metal screen.

The standard die-casting-machine guard covering the sides and top of the working area of the machine, which reciprocates automatically or has an attached interlocking gadget which prevents the metal from being injected until the guard is in the closed position, works very effectively. A die-casting machine, of course, can be regarded as a press and the safety provisions which apply to a horizontally-mounted hydraulic press apply likewise to die-casting machines. A dual push-button control, mounted away from the moving platen, is another safety measure which ensures that a worker cannot close a die unless he is well clear of danger.

One other feature of the actual mechanical operation of die-casting that must be covered with a safe-working code is where an insert of any kind has to be placed in the die. Here, there is at once the hazard that the worker will manipulate the insert in such proximity to the die face as to suffer burns. Automatic feeding of inserts though elaborate and expensive is, of course, the answer to this problem. Preloading devices for fast-working machines are admirable. Most of these use two limit-switches, one allowing the platen to be advanced only when the preloader is in the right position in relation to the die-block and the other checking the movement of the platen when the inserts have been correctly bedded. Micro-switches are increasingly utilized as safety measures on die-casting machines. Mounted on sliding elements of the die, they ensure that no movement of the parts of the die take place if and when the part is not fully advanced into the casting position.

Away from the machine itself, there are hazards in the die-casting cycle which must be anticipated. Ladling of molten alloys is a job where the application of motion-study can do much to avoid risks. The use of small bale-out furnaces which can be positioned very close to the injection chamber is increasingly being adopted as a safety measure, for this is an operation where manual dexterity is a major factor. The need to maintain all ladles in good condition is obviously of importance. Similarly, the necessity for storing and stacking ingots so as to prevent dampness or oil contamination, which may be the cause of an explosion, is part of the safe-working practice in the die-casting foundry. That sphere is well known to foundrymen, however, but new developments in machine design must be made to include built-in safety devices wherever possible.

Czech Experience with Oxygen-enriched Cupola Blast

By R. Sewell

The use of oxygen-enriched blast in cupolas for controlling melting rate and tapping temperature has gained in importance in recent years. According to M. Vilgus and V. Otohal, writing in *Slevarenstvi* (2, 1954, 10, pp. 292-296), the Czechs recently carried out investigations at the Kurim foundry to determine how best the tapping temperature could be increased with the minimum oxygen-enrichment.

Temperature Increase

A cold-blast Dobrokhotov cupola, of 4 ft. diameter, was used. Oxygen pressure was 3 to 5 ats. The oxygen was first introduced through the tuyeres, by means of a copper tube 14 mm. (⅝ in.) dia. with a pointed end. This was inserted in the main tuyeres. The nozzle end of the copper tube was 4 in. from the nose of the tuyere. After a trial period of 20 min. the tapping temperature rose to 1,450 deg. C. This result agreed with what other workers had achieved, *viz.*: with 1 per cent. of oxygen (related to the blast volume), the iron temperature was raised 12.5 to 15 deg. C.

On the other hand, the Czechs found that they could not emulate the Russian achievement of raising the iron temperature by 80 to 100 deg. C. with an oxygen consumption of 5 to 10 cub. m. per metric ton (172 to 350 cub. ft. per ton). At the second attempt, therefore, the Kurim foundry introduced the same amount of oxygen through auxiliary tuyeres. The iron was even colder during the period of blowing. The level of the auxiliary tuyeres (2 ft. 3 in. above tuyere level) was, however, at the melting zone level.

Finally, oxygen was fed into the blast system at the point where the blast pipe enters the wind belt. The results were similar to those obtained when oxygen was fed through the tuyeres.

Further tests showed that, to raise the iron temperature by 50 to 60 deg. C., it was necessary to have an oxygen enrichment of 23 to 24 per cent.

New Patents

(Copies of complete specifications are obtainable from the Patent Office Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s.)

747,312 P. Kemp, 35, rue Charcot, Bois-Colombes (Seine), France.

A process for reducing the lead content of a copper-base alloy. The alloy is treated with a solution of nitric acid containing no other substance which reacts with the alloy.

747,471 G. Imich, 9, rue Henri Say, Asnieres (Seine), France.

The dispersion of inorganic materials in metals, which uses substances capable of lowering the interfacial tension between molten metals and the metallic or non-metallic materials to be incorporated therein. These materials thus become wetted by the molten metal.

747,496 Marvin J. Udy, 546, Portage Road, Niagara Falls, N.Y., USA.

Recovery of chromium in the form of ferrochromium from ores and other chromium-bearing materials. It relates to an improved process for the production of ferrochromium products of high grade containing 4 to 6 per cent. carbon and medium-carbon grade, containing 0.5 to 4 per cent. carbon, and particularly, medium-grade carbons containing 0.1 to 2 per cent. carbon.

747,579 English Steel Corporation, Limited, River Don Works, Sheffield, 9.

Paints for foundry moulds and cores by the use of which the manufacture of moulds for heavier section castings is simplified and cheapened. A typical formulation for this paint would be as follows:—Silica flour 55 to 60; heat-hardenable formaldehyde resin 42 to 36 (dissolved in an inflammable organic solvent and providing 1.3 to 2 per cent. solid resin content in the final paint); high-melting-point pine resin 2.6; and water 6 per cent. The organic solvent could be isopropyl alcohol and ethyl acetate can be added to it.

747,584 Per Otto Stelling, 12A, Eriksbergsgaten, Stockholm, Sweden.

Treatment of pluverulent iron oxides such as oxidic iron-ores and roasted pyrites with carbon monoxide containing reducing gases in a fluidized bed, in order to produce a powder (consisting of iron oxide predominantly) which may be used as a starting material for making iron or iron alloys.

747,625 McDowall, Steven & Company, Limited, Falkirk, Stirlingshire.

A core arbor for use in casting double-socket pipes. It consists of a tube and a collar at each end of it, at least one of the collars being detachable from the tube, in order to allow for dismantling and removal of the core arbor after the pipe has been cast.

747,662 Metro-Cutanit Company, Limited, Grappenhall, nr. Warrington, Lancs.

A material which is highly resistant to heat and oxidation. It consists of. by weight, between 75.5 and 90 per cent. of a molybdenum/silicon base containing silicon 20 to 40; chromium 7.0 to 8.5; boron 1.5 to 2; or titanium 2 to 14 per cent., or both boron and titanium, but containing no other ingredients apart from usual impurities.

747,813. Sheffield Smelting Company Limited, Royds Mill Street, Sheffield, 4, Yorks, and W. J. Smellie.

A process for making a soldered joint having an aluminium-alloy component, comprising the application to the joint surface of the aluminium or aluminium-alloy component of a flux. The flux consists of potassium chloride 10 to 50, lithium chloride 8 to 50, zinc chloride 0.5 to 20, lithium fluoride 7 to 20 per cent. by weight.

748,014. Gebr. Bohler & Company, A.G., Elisabethstrasse, 12, Vienna, 1, Austria.

Tools for working metals or metal alloys. These are made of the steel alloys usual for metal working, *e.g.* high-speed steels. For the purposes of improving their essential metal working properties (especially machining properties) they have an addition of sulphur up to 1 per cent. in the form of molybdenum sulphide, manganese sulphide or lead sulphide.

748,079. Hans Gastrow, Karwendelstrasse, 28, Lichterfelde, Berlin, Germany.

A die-casting machine. The closing movement of the die and the movement of the heating cylinder over a fixed co-operating injection plunger, takes place in the same direction, effected by a common operating element, *e.g.* a hydraulic cylinder. This is connected with a support for the fixed injection plunger by means of guide bars which act as guiding means for a movable die support and a support for the heating cylinder. These guide bars form, together with the base of the machine, a firmly connected unitary structure, and in which the forces for closing the die are taken up by a frame, arranged so as to be movable on the guide bars.

748,085. Polygram Casting Company Limited, Power Road, Gunnersbury, London, W.4.

A method of making a shell mould from two half-moulds. The meeting faces of the two half-moulds are placed together, with the shaped portions in register and with an adhesive between the mating portions. Pressure is exerted on the outer surfaces of the half-moulds through the intermediary of a gas or a liquid until the adhesive has set sufficiently to hold two halves together. The pressure is then released. Patent No. **674,421** gives a method of production for the half shell-moulds themselves.

748,123. Gesellschaft für Hutten werksanlagen m.b.H., Kaiserwertherstrasse, 105, Dusseldorf, Germany.

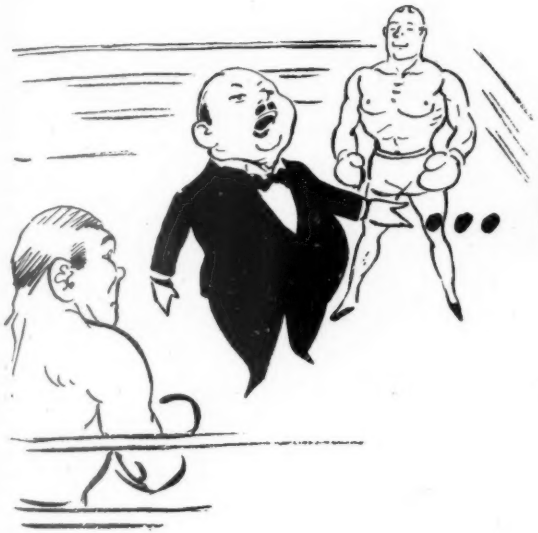
A method of making steel in an open-hearth furnace by refining molten iron from a cupola furnace. Molten iron containing at most 2.5 per cent. carbon, not more than 0.06 per cent. sulphur, and the usual contents of manganese and silicon is produced in the basic-lined cupola furnace operated by hot-blast and this molten metal is charged in a liquid condition to the open-hearth furnace.

748,167. "Vetrocoke," 8, Corso Vittorio Emanuele, Turin, Italy.

Processes for reducing iron-ore by means of a gaseous reducing agent, which consists of CO and H in the ratio of 2 or more:1. The gas after use is recycled, is cooled, and the fully oxidized compounds such as CO_2 and steam are removed—the gas thereby being restored to its gaseous-reducing-agent condition.

748,431 and **748,433.** Schultz Die Casting Company, 1810 Clinton Avenue, Toledo, Ohio, USA.

Electrically-operated. automatic controls for die-casting machines, including an accurate, controllable, electro-mechanical means for increasing the productivity of a die-casting machine.



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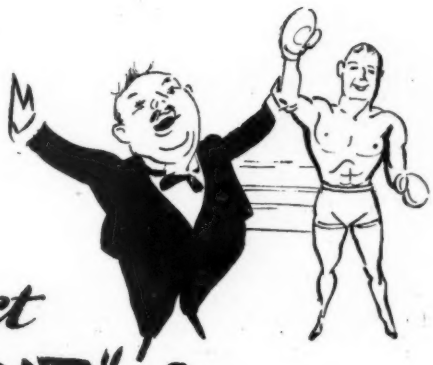

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Company News

BRITISH INSULATED CALLENDER'S CABLES, LIMITED—Group trading profit in 1955 increased by £4,473,647 over 1954 to £11,852,852. Even ignoring the considerable inter-company business, group sales to outside customers were 36 per cent. higher at the record level of £119,000,000.

CRONITE FOUNDRY COMPANY, LIMITED—An extraordinary meeting of the company is called for June 13 to create 600,000 5s. ordinary shares and to effect the one-for-one scrip issue announced on May 3. The 176,000 shares to be issued by way of capitalization of reserves will be allotted to ordinary shareholders registered on June 6.

GLACIER METAL COMPANY, LIMITED—The directors recommend a dividend of 11½ per cent. for the year ended February 29, 1956, on the £750,000 ordinary capital as increased from £650,508 by a rights issue in January. This compares with 10 per cent. for 1954-55 on the old capital and a forecast of a similar payment on the present equity.

A. COHEN & COMPANY, LIMITED, non-ferrous metal manufacturers, etc., of London, S.E.1—The board recommends a final dividend of 16½ per cent. to make 22½ per cent., less tax, for 1955. This is an effective increase of 1½ per cent. on the £300,000 capital as raised by a two-for-three free scrip issue. Group profit increased from £89,786 to £159,181 during the year.

ARNOTT & HARRISON, LIMITED, engineers' toolmakers, of London, N.W.10—The directors recommend a dividend of 25 per cent., less tax, for 1955, on the £529,060 one-class capital. For the previous 18 months' period an interim payment of 30 per cent. was made on the £264,530 capital, and a final of 22½ per cent. on the present capital as increased by a one-for-one scrip issue.

COVENTRY MACHINE TOOL WORKS, LIMITED—The company is stepping up the dividend from 12½ per cent. to 17½ per cent. on the £100,000 one-class capital, for 1955. Group profit is down from £77,567 to £71,988. At the meeting to be held on June 29, a resolution will be proposed for doubling the authorized capital to £300,000. No issue of shares is contemplated in the near future.

GASKELL & CHAMBERS, LIMITED, engineers, coppersmiths, brassfounders, etc., of Birmingham—The board has decided after further consideration that owing to the present situation the time is inopportune to make a rights issue as originally announced in the chairman's statement to stockholders. Other methods are being considered to raise the additional working capital required for immediate needs.

B. O. MORRIS, LIMITED, makers of flexible shafting and shaft machines, of Coventry—The company has declared a third interim dividend, in lieu of a final, of 5 per cent., making 15 per cent. for the year ended January 31, 1956, as previously. During the year, however, ordinary holders also received 5 per cent., free of tax, from realized capital profits, against a similar payment of 2 per cent. in 1954-55.

PLATT BROS. & COMPANY (HOLDINGS), LIMITED—The chairman, Mr. K. H. Preston, states that nearly 70 per cent. of the subsidiary companies' products are exported, and in these export markets there is severe foreign competition. If wage rates in this country continue to increase faster than those of foreign competitors, the company will find it increasingly difficult to retain the position it now claims as the world's largest textile machinery group.

THOS. FIRTH & JOHN BROWN, LIMITED—The company has declared an interim dividend of 4 per cent. on the £5,500,000 ordinary shares, payable July 3 to members registered June 2. This increase from 3 per cent. is to reduce the difference between interim and final dividends. With the 6 per cent. final dividend paid last February, the total for the year to October 1, 1955, was 9 per cent., as against 8 per cent. forecast when the capital was offered for sale by ISHRA in March, 1955.

POWELL DUFFRYN, LIMITED—The referee appointed under the Coal Industry Nationalization Act, 1946, to review the valuation by the South Wales District Valuation Board of the PD electricity undertaking, which vested in the NCB on January 1, 1947, has now announced his decision, which is final, placing the value of the undertaking at £2,628,600, giving a net figure, after deducting capital outlay refunds, of £2,557,868. This, with amounts already determined in respect of all other group assets vested in the NCB, makes the aggregate compensation to the group in respect of vested assets £15,964,712, of which there has already been received on account £14,689,112, leaving to be received the sum of £1,275,600. It is expected that the last sum will be satisfied by an issue of 3½ per cent. Treasury stock, 1977-80, on June 15.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

FORMOSA, June 11—Miscellaneous iron and steel products, generators and motors, electrical apparatus, machine tools, metal-working machinery, industrial machinery, etc., for the Central Trust of China, Taiwan. (ESB/13802/56.)

INDIA—Diesel electric locomotives, for the chief controller of purchase, Hindustan Steel Private, Limited, Calcutta. (ESB/13079/56.)

INDIA, June 13—Railway locomotive components, for the Director-General of Supplies and Disposals, Government of India. (ESB/13263/56.)

INDIA, June 19—Cable and cable boxes, for the Government of Madras, Department of Electricity. (ESB/13058/56.)

INDIA, June 20—Instruments, meters, and measuring and testing equipment, for the Government of India, India Supply Mission, Washington, DC, USA. (ESB/13440/56.)

INDIA, June 21—Crankshaft grinding machine, for the Director-General of Supplies and Disposals, Government of India. (ESB/13571/56.)

INDIA, June 22—Diesel-electric locomotives, for Hindustan Steel, Limited, Calcutta. (ESB/13574/56.)

SOUTH AFRICA, June 14—Diesel engines, for the Irrigation Department, Pretoria. (ESB/13579/56.)

SOUTH AFRICA, June 26—Combined surfacing and thicknessing machine, for the Stores Department of the South African Railways. (ESB/13541/56.)

S & L Development Plan

Expenditure of about £6,250,000 on developments at Corby (Northants) is announced by Stewarts and Lloyds, Limited. Authorized by the Iron and Steel Board, the project will take nearly 10 years to complete.

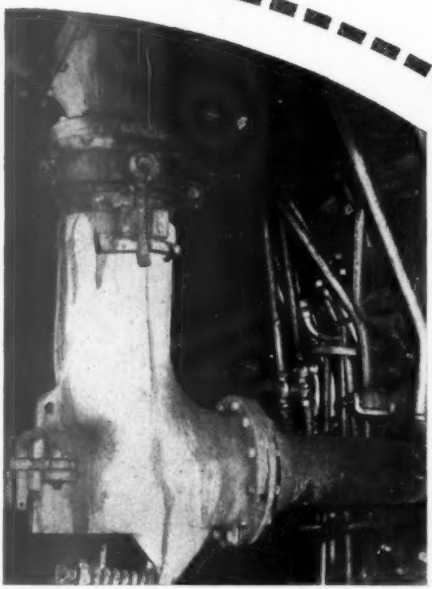
The first stage will be the construction of 50 new coke ovens, complete with ancillary coal-preparation plants and by-products plant.

When the ovens come into operation in about four years, work will begin on the reconstruction of about two thirds of the existing 143 coke ovens, most of which have been operating since the works opened 23 years ago.

MONOLITHIC PIPE LININGS

Examples of another of the many uses for

REFRACTORY CONCRETE



Refractory concrete-lined goose necks in position on blast furnace from bustle pipe to tuyere

A battery of refractory concrete-lined ascension pipes in service

Not only because of its great economy and ease of placing, but, being completely non-spalling and highly resistant to scour, it forms a really lasting non-collapsible rigid lining for foul mains, ascension pipes, bustle pipes, and similar hard duty applications.

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We will gladly forward on request a list of suppliers of crushed firebrick and other refractory and insulating aggregates, and of manufacturers of ready-prepared castable mixes incorporating CIMENT FONDU, to which only water need be added to make REFRACTORY CONCRETE.

Coke oven ascension pipes showing Refractory Concrete lining

REFRACTORY CONCRETE

The adaptable Refractory material made with crushed firebrick and CIMENT FONDU

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You are invited to write for further details and photographic examples

AP3-1248

Imports and Exports of Iron and Steel in April

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in April. Totals for the first four months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended April 30.	Four months ended April 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Channel Islands	466	2,333	1,960
Cyprus	1,113	1,654	1,915
Sierra Leone	352	3,037	2,075
Gold Coast	1,967	9,334	9,111
Nigeria	5,647	15,263	21,782
Union of South Africa	3,913	30,359	28,227
Rhodesia and Nyasaland	8,660	24,804	24,882
Tanganyika	2,361	4,821	5,568
Kenya	8,677	18,564	17,372
Uganda	343	1,563	1,938
Anglo-Egyptian Sudan	1,486	5,997	6,824
Mauritius	140	839	734
Aden	517	3,984	2,007
Bahrain, Qatar, and Trucial States	1,663	4,974	3,947
Kuwait	967	1,418	1,444
India	26,815	48,140	106,024
Pakistan	3,124	19,117	15,725
Singapore	2,859	14,133	11,203
Malaya	3,973	7,045	12,351
Ceylon	3,718	6,925	12,460
British North Borneo	509	1,597	2,080
Hongkong	6,412	17,062	20,852
Australia	16,882	163,453	77,871
New Zealand	22,103	97,758	71,340
Canada	24,920	29,131	85,626
Jamaica	2,757	4,379	9,120
Trinidad	2,807	18,043	12,993
British Guiana	269	2,261	1,786
Other Commonwealth countries	3,078	8,596	8,792
Eire	7,329	19,361	24,300
Finland	4,886	25,633	15,958
Sweden	14,046	47,848	43,871
Norway	7,383	44,183	28,190
Denmark	6,670	28,059	20,501
Western Germany	173	2,305	8,277
Netherlands	5,737	35,883	28,764
Belgium	3,899	7,550	13,324
France	361	2,161	2,589
Switzerland	935	5,665	4,817
Portugal	989	4,371	3,045
Spain	4,745	22,583	11,483
Italy	1,301	9,276	6,599
Austria	362	976	1,719
Yugoslavia	4	8,294	1,202
Greece	540	3,792	1,924
Turkey	378	3,437	1,155
Netherlands Antilles	647	4,676	4,186
Portuguese E. Africa	301	574	985
Lebanon	688	727	3,373
Egypt	5,414	11,356	17,439
Israel	367	3,677	3,831
Saudi Arabia	1,041	3,529	3,040
Iraq	3,518	8,962	13,713
Iran	14,261	17,176	31,197
Burma	628	5,321	2,588
Thailand	857	1,872	3,205
Indonesia	958	1,235	4,420
Philippine Republic	39	1,845	1,869
USA	5,661	14,814	15,627
Cuba	849	1,571	3,927
Colombia	326	2,942	909
Venezuela	7,703	22,933	24,702
Ecuador	151	853	885
Peru	705	3,168	5,713
Chile	117	469	258
Uruguay	196	3,298	1,787
Argentina	2,721	23,908	16,939
Other foreign countries	2,713	13,633	9,649
TOTAL	268,097	986,500	960,969

Total Imports of Iron and Steel

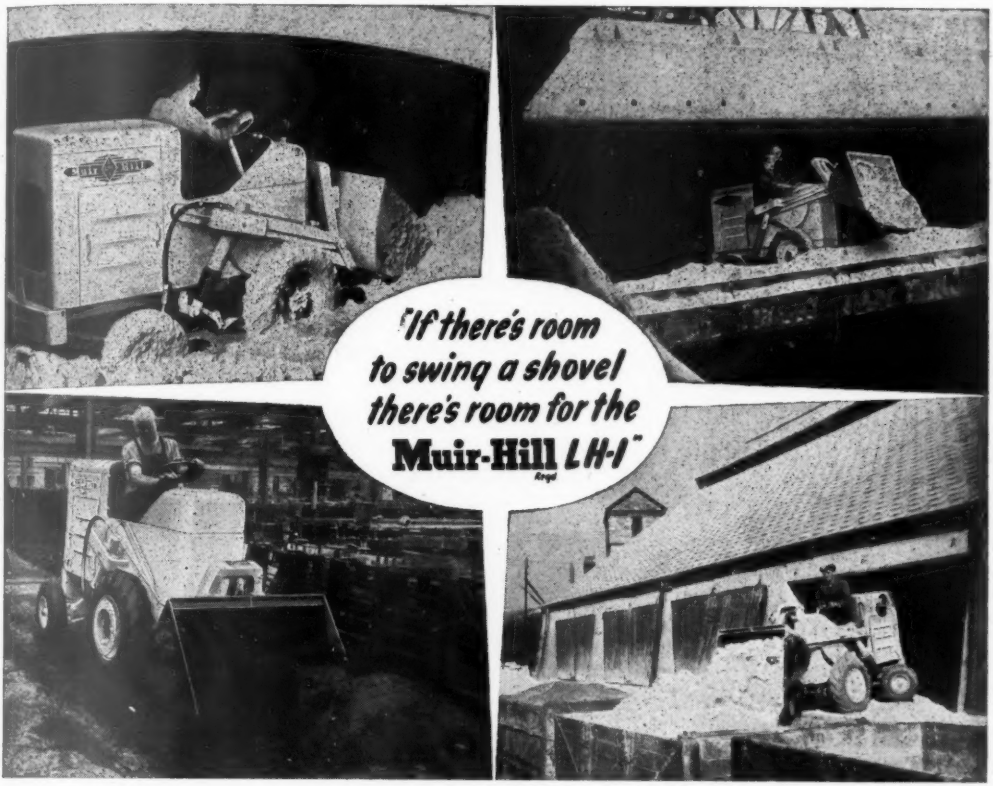
From	Month ended April 30.	Four months ended April 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	197	1,049	846
Australia	14	7	28
Canada	5,612	28,903	18,597
Other Commonwealth countries and Eire	526	3,367	2,186
Soviet Union	25,693	71,148	104,418
Sweden	3,638	19,215	13,904
Norway	5,710	24,043	36,469
Western Germany	28,068	8,472	89,404
Netherlands	8,945	37,943	45,727
Belgium	33,247	33,031	150,009
Luxembourg	5,404	9,626	26,578
France	20,202	55,944	112,448
Italy	1,484	73	4,375
Austria	14,455	43,556	68,660
Japan	1,107	1,257	6,874
USA	82,238	211,199	242,164
Other foreign countries	6,546	4,635	18,669
TOTAL	243,086	544,468	941,366
Iron and steel scrap and waste, fit only for the recovery of metal	70,016	378,663	324,801

Exports of Iron and Steel, by Product

Product.	Month ended April 30.	Four months ended April 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Pig-iron	10,821	20,143	37,712
Ferro-colombium (niobium)	20	39	66
Ferro-tungsten	77	162	353
Other ferro-alloys	534	949	1,324
Ingots, blooms, billets, slabs, sheet, and tinplate bars	145	2,739	898
Iron bars, rods, angles, shapes, and sections	247	1,432	715
Steel bars, rods, angles, sections, and shapes	46,530	156,827	151,127
Iron plates and sheets	16	49	86
Universal plates	535	3,735	2,018
Steel plates, $\frac{1}{8}$ in. and under $\frac{3}{16}$ in.	1,259	7,511	3,992
Do., $\frac{3}{16}$ in. and over	21,644	100,741	79,725
Blacksheets and black plate	22,049	83,307	79,204
Hoop and strip	8,942	40,724	33,045
Tinplate	24,382	116,451	99,592
Decorated tinplate	387	1,022	2,316
Galvanized sheets	13,230	58,719	46,767
Other (incl. tinned sheets, terne-plate, and ternesheets)	1,258	6,119	4,828
Railway and tramway construction material	27,069	88,970	106,943
Wire rods	4,672	11,861	13,592
Wire	9,450	39,009	33,841
Tubes, pipes, and fittings	74,112	241,024	260,222
Iron castings	156	3,099	587
Steel castings	162	678	589
Forgings	400	1,190	1,427
TOTAL	268,097	986,500	960,969

STEEL PRODUCTION in South Africa totalled more than 1,500,000 tons in 1955. This was an increase of about 10 per cent. on the 1954 figure. Steel consumption, too, went up by about 10 per cent.

TECALEMIT, LIMITED announce that Mr. J. E. Drinkwater, deputy general factory manager, has left by air for a six-week tour of the United States and Canada to study American management and production methods.



The Muir-Hill LH-1 is a compact, highly manoeuvrable diesel-powered loader with the unique advantage of bringing bulk material handling in confined areas out of the hand shovel into the mobile power loading class.

6ft. 6in. working ceiling, 7ft. 6in. turning radius, 4ft. 3in. width—consider these dimensions in relation to those awkward places where you have never before been able to employ any form of mechanisation—and then ask us to send you further details on the LH-1.

It does not matter what material you are handling, the LH-1 has the right bucket for the job, with a range of 14.5, 10.5 and 6.5 cu. ft. capacities, a special ore bucket and a fork lift attachment of 1,000 lbs. rated capacity with evenly distributed loads.

Send for the LH-1 Brochure!

Muir-Hill LH-1

BUILT BY BOYDELL

E. BOYDELL & CO. LTD. · UNIVERSAL WORKS · OLD TRAFFORD · MANCHESTER 16

dm EB 561

Raw Material Markets

Iron and Steel

Output of pig-iron is maintained at a high level and most grades are disposed of readily. Imports of iron ore have been maintained at recent levels and, with home-produced supplies, have provided adequate tonnages for burdening the furnaces, although some deficiency has taken place in the higher grades used in the making of hematite and low-phosphorus iron, chiefly on account of the falling off in deliveries from North Africa.

The steelworks continue to absorb available supplies of basic pig-iron; priority is given to their requirements when possible, as some furnaces previously engaged in the production of high-phosphorus iron are now supplying basic steelmaking pig-iron. Furnaces now in course of construction will provide additional tonnages and these will be welcomed. The foundry grades of pig-iron are mostly in good demand, but supplies are not too plentiful. The low-phosphorus and medium-phosphorus qualities are fully taken up, and while the reduced pressure for castings from the motor vehicle trade has eased the position, the demand for these grades from other producers of high-duty castings are not fully met, although their quotas have been increased. Hematite is now in better supply; production has been stepped up, while demand from some of the engineering foundries has decreased. The steelworks are, however, absorbing large tonnages of hematite and the quantities available to the foundries are generally promptly taken up.

A slight increase in demand for light castings has improved the position at many of the light foundries, but the pressure is not heavy and productive capacity exceeds present demands. Most of the jobbing foundries are fairly active, but the textile foundries are in need of more work. High-phosphorus iron used by these foundries just about covers consumption, but there has been a big drop in production recently and the tonnages available for distribution have declined.

The supply of scrap appears to satisfy the current needs of the foundries. Foundry coke is coming forward steadily, while no difficulty is experienced in getting full deliveries of ganister, limestone, and firebricks.

The re-rolling mills are well occupied in all areas. Orders on hand for small bars, light sections, strip, etc., are plentiful and there is a regular flow of fresh business. There is also a strong demand on oversea account, but in most cases the inquiries have to be turned down. The steel semis on hand enable the re-rollers to maintain fairly good outputs, but in some areas shortage of manpower is an obstacle to production; the position has improved, but some of the mills are still short of labour. Deliveries of billets from home sources are being received regularly. Owing to the liquidation of stocks at the re-rollers, however, pressure for supplies has increased, particularly for the smaller sized billets of 2 in. and 2¼ in. sq. and for special steels. It is understood that supplies of steel semis from abroad are being received by the re-rollers and that regular deliveries will be made during the next few months.

Non-ferrous Metals

Price movements on the London Metal Exchange are irregular, but on Tuesday there was an upward turn in the trend of copper. Demand, however, is not good on the other side of the Atlantic. In the United States, primary producers still hold to the 46-cent level, compared with 40 cents quoted by the Custom smelters. The former are understood to be fully sold for June metal and until their books are open for the July sales it is possible that no change will be made. Poor demand for copper is emphasized by the curtailment of operations at many of the brass mills and in some instances the laying off of workers or short-time working are reported.

Stocks of refined copper in LME official warehouses increased by a further 890 tons to 4,883 tons during the week ended on Saturday.

Tin, too, is quiet, but there is little on the consumption side to suggest weakness. US consumption during the first quarter of this year was 10 per cent. higher than that absorbed in the corresponding period last year.

Moreover, world consumption in March was the highest since August, 1950, according to the International Tin Study Group. Nevertheless, the London price had followed copper on its downward course and was close to the buffer pool's upper buying limit of £720 a ton.

Demand for lead is reasonably good and nearby supplies are not plentiful, as suggested by the widening of the backwardation. Trading in the US continues to be dull on the basis of 16 cents a pound. It is expected, however, that lead offerings to the stockpile will be appreciably larger this month. Zinc has been an irregular market, with the price easing. In the States offers to the stockpile are also expected to be considerably larger this month.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* May 31, £293 to £293 10s.; June 1, £294 10s. to £295; June 4, £295 to £295 10s.; June 5, £304 10s. to £305; June 6, £314 to £316.

Three Months: May 31, £291 10s. to £292; June 1, £292 10s. to £293; June 4, £295 10s. to £296; June 5, £304 10s. to £305; June 6, £315 to £316.

TIN, Standard—*Cash:* May 31, £725 to £726; June 1, £723 to £724; June 4, £724 to £725; June 5, £729 to £730; June 6, £735 to £735 10s.

Three Months: May 31, £725 to £726; June 1, £723 to £724; June 4, £723 10s. to £724; June 5, £727 10s. to £728; June 6, £732 10s. to £733.

LEAD—*Second half May:* May 31, £109 10s. to £109 15s. *First half June:* June 1, £109 15s. to £110; June 4, £109 15s. to £110; June 5, £110 5s. to £110 10s; June 6, £112 to £112 5s.

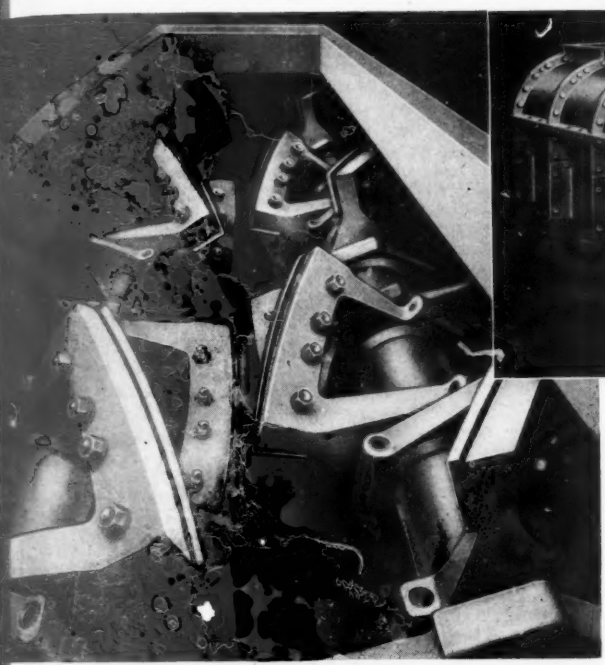
Second half August: May 31, £106 10s. to £106 15s. *First half September:* June 1, £107 to £107 5s.; June 4, £107 to £107 10s.; June 5, £107 10s. to £107 15s.; June 6, £110 to £110 5s.

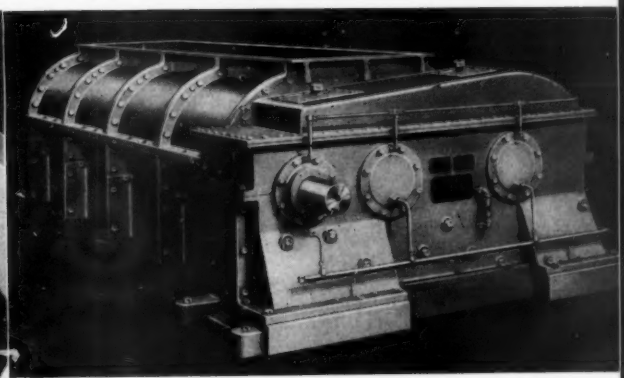
ZINC—*Second half May:* May 31, £91 10s. to £91 15s. *First half June:* June 1, £91 5s. to £91 15s.; June 4, £91 15s. to £92; June 5, £92 to £92 10s.; June 6, £92 15s. to £93.

Second half August: May 31, £89 5s. to £89 10s. *First half September:* June 1, £89 10s. to £89 15s.; June 4, £89 15s. to £90; June 5, £90 5s. to £90 10s.; June 6, £91 5s. to £91 15s.

A CONFERENCE on technical education and industry, to be held in the City Chambers, Glasgow, on June 19 under the auspices of the Regional Advisory Council for Technical Education, will be attended by experts in both fields. One of the subjects to be discussed will be the means by which the Government expansion scheme for technology can best be adapted to modern requirements. Among the speakers will be Sir Walter Puckey, who was president of the Institution of Production Engineers from 1953 to 1955.

FOUNDRY EQUIPMENT — Batch and Continuous Sand Mixers

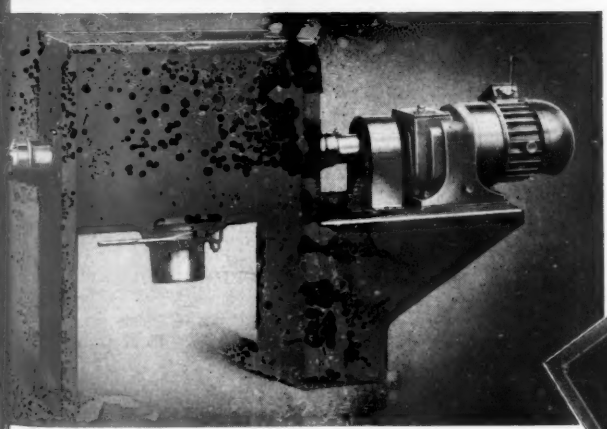




CONTINUOUS MIXERS

As made and installed by Baker Perkins, U.S.A. in America's largest foundries.

Built in standard sizes with continuous outputs of 6 tons to 120 tons per hour of thoroughly aerated and homogeneously mixed moulding sand.



TCH MIXERS Made in a variety of sizes.

The Characteristic Simplex blade design.

BAKER PERKINS LTD
Engineers
WESTWOOD WORKS — PETERBOROUGH

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

June 6, 1956

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £17 11s. 0d.; Birmingham, £17 3s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £20 8s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £20 12s. 3d.

Scotch Iron.—No. 3 foundry, £21 14s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £23 16s. 6d.; South Zone, £23 19s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 4s. 0d.; South Zone, £25 6s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent. :—N.-E. of England (local iron), £21 7s. 6d.; Scotland (Scotch iron), Zone S. 1, £21 14s. 0d.; Sheffield, £22 14s. 6d.; Birmingham, £23 2s. 0d.; Wales (Welsh iron), £21 7s. 6d.

Basic Pig-iron.—£18 3s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £48 0s. 0d. to £50 5s. 0d., scale 16s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £73 2s. 6d., scale 16s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 27s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 11s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £250 0s. 0d.; 38/40 per cent., £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 18s. 0d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 21s. 0d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent.C, £93 10s.0d. to £95 0s. 0d., basis 60 per cent. Cr, scale 29s. 9d. to 32s. 0d. per unit; over 6 per cent. C, £92 10s. 0d. to £93 0s. 0d., basis 60 per cent. Cr, scale 29s. 9d. to 32s. 0d. per unit; 2 per cent. C,* 2s. 1d. per lb. Cr; 1 per cent. C,* 2s. 1⅛d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £249 0s. 0d.; 96/98 per cent., £259 0s. 0d. to £265 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 24s. to 25s. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £66 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £28 19s. 0d.; tested, 0.08 to 0.25 per cent. C, £29 19s. 0d.; hard (0.41 to 0.60 per cent. C), £31 0s. 6d.; silico-manganese, £39 10s. 0d.; free-cutting, £33 3s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £36 14s. 6d., silico-manganese, £39 17s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £34 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £35 16s. 0d.; acid, up to 0.25 per cent. C, £38 17s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £35 7s. 0d.; boiler plates (N.-E. Coast), £37 17s. 0d.; floor plates (N.-E. Coast), £36 16s. 0d.; sectional material, N.-E. Coast, £33 16s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested (4-ton lots), £36 3s. 0d.; flats, 5 in. wide and under (4-ton lots), £36 3s. 0d.; hoop and strip, £36 12s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £38 16s. 0d.; black sheets (hand mill), 17/20 g., £50 4s. 6d.; galvanized corrugated sheets, 24 g., £62 9s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £61 13s. 9d.; nickel-chrome, £85 10s. 6d.; nickel-chrome-molybdenum, £96 16s. 6d.

NON-FERROUS METALS

Copper.—Cash, £314 0s. 0d. to £316 0s. 0d.; three months, £315 0s. 0d. to £316 0s. 0d.; settlement, £316 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 10¾d. per lb.; rods, 328s. 9d. per cwt. basis; 20 s.w.g., 362s. 0d. per cwt.

Tin.—Cash, £735 0s. 0d. to £735 10s. 0d.; three months, £732 10s. 0d. to £733 0s. 0d.; settlement, £735 10s. 0d.

Lead (Refined Pig).—First half June, £112 0s. 0d. to £112 5s. 0d.; first half September, £110 0s. 0d. to £110 5s. 0d.

Zinc.—First half June, £92 15s. 0d. to £93 0s. 0d.; first half September, £91 5s. 0d. to £91 15s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £123 5s. 0d.; rolled zinc (boiler plates), all English destinations, £121 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, —.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 4¾d. per lb.; rods, drawn, 3s. 2¾d.; sheets to 10 w.g., 310s. 0d. per cwt.; wire, 3s. 0¾d.; rolled metal, 295s. 0d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £182; B6 (85/15), £250; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), —; HTB2 (38 tons), —; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £267; LG3 (86/7/5/2), £281; G1 (88/10/2/½),—; (88/10/2/1), —.

Phosphor Bronze.—BS1400, PB1 (AID released), £345 per ton.

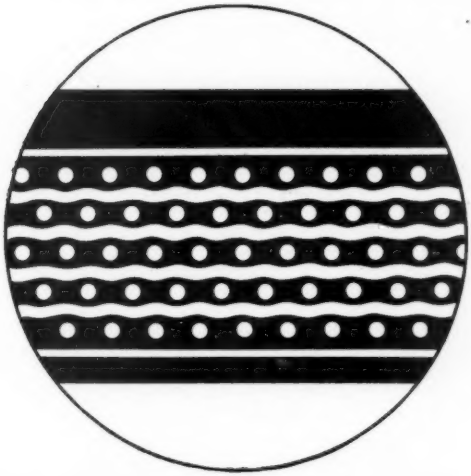
Phosphor Bronze Strip, etc.—Strip, 426s. 9d. per cwt.; sheets to 10 w.g., 451s. 3d. per cwt.; wire, 4s. 5½d. per lb.; rods, 3s. 9½d.; tubes, 3s. 7½d.; chill cast bars: solids 3s. 9½d., cored, 3s. 10½d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 4s. 0¾d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 5½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 4½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 4d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £87 0s. 0d. Nickel, £519 0s. 0d. Aluminium ingots, £189 0s. 0d.; aluminium bronze (BS1400), AB1, £320; AB2, —. Solder, brazing, BS1945; type 8 (50/50), 3s. 1d. per lb., type 9 (54/46), 3s. 4½d. per lb.

* Average 68-70 per cent.

Focus on conveyor belting proves Goodyear superiority



There is obviously only one way of proving to yourself beyond any doubt that Goodyear conveyor belting gives long and reliable service. That's by installing it.

But for proof in advance there's the record of efficiency of Goodyear conveyor belts in thousands of existing installations in this country—in steelworks, power stations, mines, quarries, factories and foundries.

At a big steelworks, for instance, Goodyear belts conveying hot sinter are lasting over twice as long as other makes previously used.

QUICK PROOF

Focus on conveyor belting proves Goodyear superiority, and quickly confirms that Goodyear belting makes every conveying job an economic proposition.

The emphasis is on *every*. Whatever the conveying work, there's a "job-designed" Goodyear belt to do it at the lowest cost per ton.

This cost-saving is ensured by the exceptionally high quality built into every Goodyear belt. And this quality is ensured by rigid adherence to raw material specifications and stage by stage production inspection.

RUGGED CONSTRUCTION OF GOODYEAR BELTING

A Tough, heavy-duty cover compounded to suit job.
B Breaker fabric to improve bond between cover and carcass—when required.
C Plies of close-woven duck, inhibited against mildew.
D Skim coat between plies prevents separation.
E Rugged edge cover resists wear.

QUICK DELIVERY

You can now get quick delivery of Goodyear conveyor belts, which are available with cotton or rayon carcass in any width up to 72 inches. They can be supplied in a few weeks against specific ordering.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

CONVEYOR BELTING · TRANSMISSION BELTING · V-BELTS · INDUSTRIAL HOSE

News in Brief

THE BATTERY of 15 coke ovens of Sadler & Company, Limited, at Bishop Auckland (Co. Durham), is to be extended by the erection of a further 11 ovens.

THE SWANSEA OFFICE of the Metropolitan-Vickers Electrical Company, Limited, is now at 166, St. Helen's Road, while the address of the company's Edinburgh office is now 61a, Queen Street, Edinburgh, 2.

CHARLES ROBERTS & COMPANY, LIMITED, carriage and wagon builders and financiers, of Horbury Junction, near Wakefield, have issued a souvenir publication to commemorate the centenary of the company.

THE Federation of Light Metal Smelters announces that its members' average selling prices for April, calculated to the nearest 10s., were as follow:—LM1, £197 10s. per ton; LM2, £195 10s.; LM4, £204; LM6, £210.

Mrs. J. N. COMPTON, wife of the technical director of the Yorkshire Engine Company, Limited, opened the firm's new sports ground at Templeboro' on Saturday, May 26. Among those present were the Mayor and Mayoress of Rotherham, Councillor and Mrs. F. Davies.

SAMUEL OSBORN & COMPANY, LIMITED, steelmakers, Sheffield, who have bought 73 acres of land for future development at Eckington, Derbyshire, expect to have a small foundry in production there by next January, and hope to be employing 80 at Eckington by next summer.

THE BIRMINGHAM BRANCH OFFICE of Midland Silicones, Limited, has moved from its former address at Oldbury to larger and more central premises. The new address is:—Midland Silicones, Limited, Union Chambers, 63, Temple Row, Birmingham, 2. (Telephone: Midland 7705.)

THE PUBLIC was allowed to tour the River Don works of the English Steel Corporation, Limited, at Sheffield, on May 29, for the first time so that families of workers could visit and see the works. A two-hour tour was joined in by hundreds of families, and the experiment was repeated on May 30.

SIR ALFRED HERBERT, chairman of Alfred Herbert, Limited, the machine tool group, Coventry, celebrates his 90th birthday on September 5. The Council of the Gauge and Toolmakers' Association is arranging a luncheon to mark the occasion, and as a tribute to his distinguished career in the engineering industry.

MARRISON & CATHERALL, LIMITED, makers of permanent magnets and cores for transformers and chokes, Forncett Street, Sheffield, will soon be leaving those premises for a new £50,000 factory just built in Forge Lane, Killamarsh. The new works is now 75 per cent. in production and is expected shortly to take over completely.

R. & A. MAIN AND MAIN REFRIGERATION LIMITED, Gothic Works, Angel Road, Edmonton, London, N.18, announce that their offices and works will close for the summer holidays from the evening of Friday, July 20, to the morning of Tuesday, August 7. During the closure, a small staff will attend to urgent correspondence.

DONCASTER PRODUCTIVITY ASSOCIATION decided at their annual meeting on May 29, to sponsor the first fuel-efficiency and smoke-abatement exhibition to be held in the town. It is hoped to stage it in April, 1957. It is estimated that atmospheric pollution in the Doncaster district costs the town several thousands of pounds a year in fuel-waste and other losses.

MINISTERIAL APPROVAL has been given in the test case of insurance involving 150 four-days-a-week workers in Doncaster at the works of John Fowler, Limited, engineers. They will be eligible for benefit on their idle day—Friday. In April an arbitration tribunal decided that the workers should be eligible for benefit on that day, and the Ministry has now approved the award.

NEWTON CHAMBERS & COMPANY, LIMITED, Thorncliffe, Sheffield, has many close links with the Boy Scout movement as a number of its officials are in the organization. They have learned that their agent in Malta, Mr. Emanuel J. Cushieri, has been awarded the Silver Acorn, one of the highest awards of the movement. He is quartermaster and camp commandant of the local association in Malta.

THE BRITISH WELDING RESEARCH ASSOCIATION are to hold their annual luncheon and exhibition of researches on Tuesday, July 24, at the Engineering Research Station, Abington Hall, near Cambridge. The Rt. Hon. R. Maudling, M.P., Minister of Supply, will be the principal speaker at the luncheon. The exhibition will enable visitors to see research work in progress and demonstrations of welding various metals will be given.

THE FOUNDRY and heavy forging plant of the 500-acre site at Tinsley acquired for extensions of the English Steel Corporation Limited, Sheffield, are not expected to be in full operation until 1962. These comprise the first part of these extensions, and a considerable amount of design is required at the planning stage. When these schemes are in operation, the new plant will partly replace present equipment at the River Don and Grimesthorpe works.

DORMAN, LONG (BRIDGE AND ENGINEERING), LIMITED, of Middlesbrough, have secured the contract from the Lancashire County Council, for the construction of the Higher Walton Bridge, which will carry the new Preston by-pass motorway over the River Darwen, and the main Preston-Blackburn road, about three miles south-east of Preston. The contract is worth £193,690. 670 tons of steel will be used, and this will be made at the works of the company at Tees-side.

THE EXECUTIVE of the Amalgamated Union of Foundry Workers were asked by the West of Scotland district, in a resolution moved at the union's conference at Llandudno on May 28, to negotiate immediately for a seven-hour normal working day without reduction of wages. The 60 delegates, representing 77,000 workers, referred this resolution to the executive, and carried a Nottinghamshire motion requesting the executive to keep up the pressure for a 40-hour week.

WARWICK SCHOOL is to receive a grant of £27,000 from industry towards the £42,000 cost of building a new science block. It is one of the first schools to receive a grant of this kind. The chairman of the governors, Alderman Guy Nelson, said that the grant will come from the Industrial Fund for the Advancement of Scientific Education in schools. This was established to help schools to build new laboratories so as to meet the increasing demand for scientists and technicians.

BIRLEC, LIMITED, announce that a contract has been placed with them by Wellworthy, Limited, Lymington, Hants, for a high-frequency melting-furnace installation. Comprising one 1,250-kw. motor/alternator set and two furnaces each of 3 tons capacity, the installation is of particular interest since, in the United Kingdom at least, it will be the largest high-frequency unit to be commissioned specifically for the production of grey- and alloy-iron castings. To ensure a constant supply of hot metal for the casting shop a 10-ton Birlec gas-fired holding furnace will also be provided.